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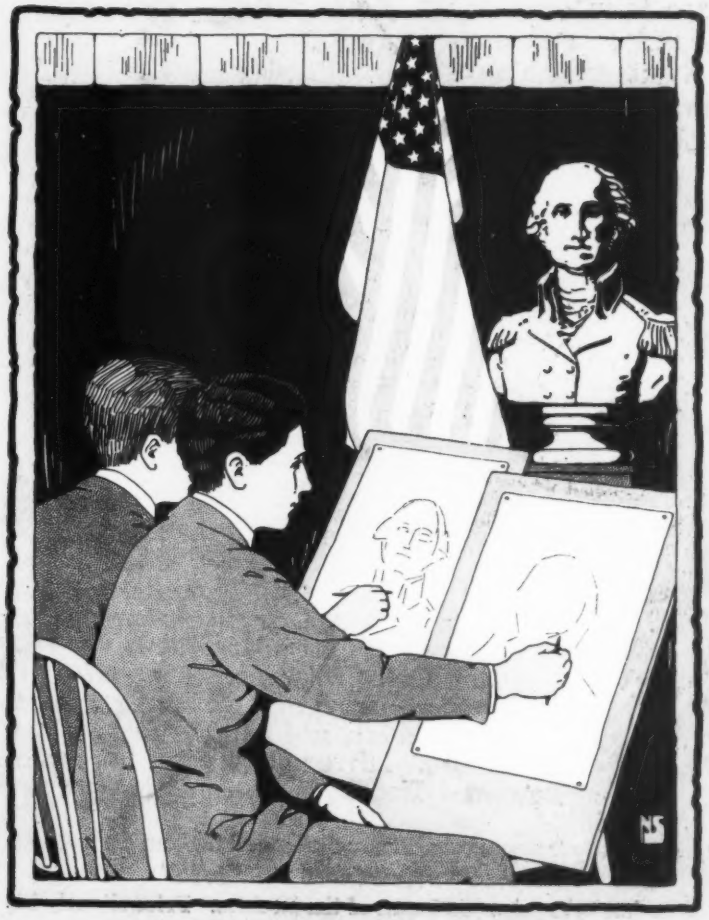

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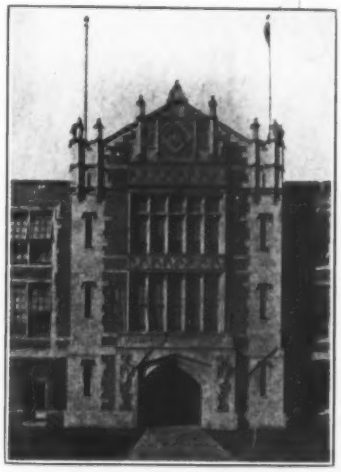

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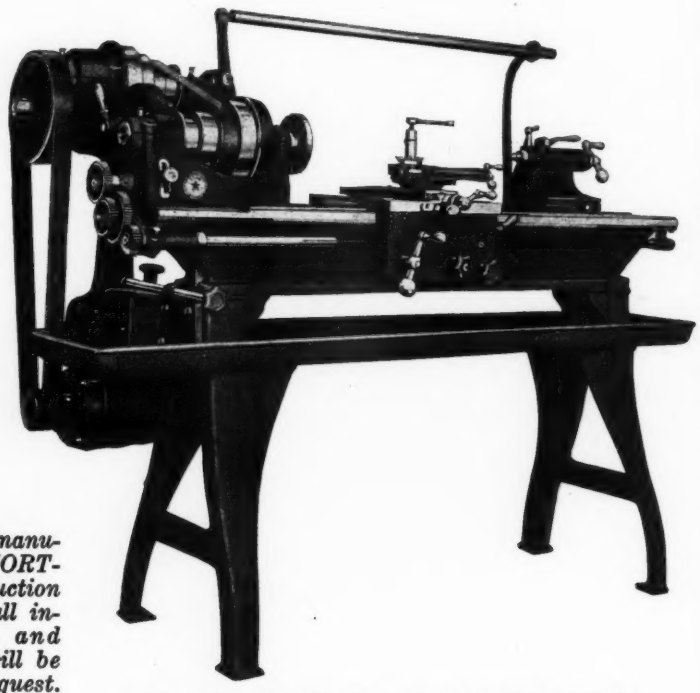

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THE INDUSTRIAL ARTS MAGAZINE

Volume XIV FEBRUARY, 1925 No. 2

Vitalizing the Study of Machinery[1]

Arthur B. Mays, Associate Professor of Industrial Education, University of Illinois.

THE shop teacher often feels the need of some effective means of leading his students to handle machinery in a more intelligent manner. Boys, otherwise intelligent, will often do the most foolish things when working with machinery. This may be attributed to various causes, but one very frequent cause is a lack of appreciation of the wonderful mechanisms which are being controlled. It has been found that the method of machine study presented here solves this problem for many boys and is a great help in the teaching of machine shop courses.

In the great majority of shop courses involving the use of machinery, the largest part of the attention is centered on the operation of the machines and on the product. Even in courses involving machine operations only, little or no attention is given to the thorough understanding of the machine itself. It is true that courses in machine design are given in many institutions, and that in a few, courses in the study of machines are offered, but in most cases the emphasis is placed on the mechanical or mathematical problems involved in the design of machines, and in the study of mechanisms in a more or less abstract fashion.

The following plan of study is an attempt to map out for the resourceful shop teacher a method by which he can work out a course of study in machine analysis which will appeal to the imagination and the immediate interests of the students.

This study considers the machine as a *mechanical "organism" with a living force flowing through it,* and further as an "organism" with an historical growth from small and very simple beginnings. It has been found that when machine analysis is presented from this point of view, and that when the more abstract study of mechanisms follows, the tracing out of this "living force." which flows through the machine, performing by means of the machine its intended work, that such a study will become motivated in such a way as to have lost its purely abstract and often uninteresting character.

From the last statement it may be seen that it is not at all intended that such an analysis as this shall take the place of a study of the principles of mechanisms, but that it shall precede the more abstract study, with the purpose of supplying to the student's mind, a greater immediate motive for the more technical analysis of machinery.

It is believed further that this type of machine study will serve as a stimulus to a greater interest in all machinery, and will give a basis for the development of greater ability to "meet and master new situations" as they may arise in the handling of machines. When a student or mechanic, anywhere, is confronted with a new machine or with an old one which "won't work," if he be experienced in tracing out the lines of power through machines, he will soon be able to understand the new machine or to find the trouble with the old one. Just such ability on the part of mechanics is greatly in demand, and the development of this type of ability is rarely considered in training courses.

To approach the study of machines from the point of view of their historical development has also been found a most effective means of stimulating interest in the analytical study to follow. The following suggestive historical sketch has been used successfully for this purpose.

Development of Machinery

The growth of civilization has been closely bound up with the development of tools and machines with which man has waged war and performed the work of life. Every tool and every machine familiar to modern life is the result of many years of growth. The complicated semi-automatic machine of the modern factory, the marvelous printing presses which print, cut and fold our daily papers without the aid of human hands, and the powerful automobile which can be driven by a child, were not invented "full grown," but were once very simple, crude machines. Man, in his efforts to make his labor more effective, invented simple machines, then as he worked with these machines, he thought of changes which would make them more efficient. These changes came about very gradually and are still being made. Every modern machine, however complicated, is either the result of the evolution of some crude, simple machine or is a combination of a number of machines each of which was developed from a simple machine.

In tracing the development of modern machines, certain general stages of growth may be noted. In his

[1]The writer is indebted to Professor Robert W. Selvidge of the University of Missouri for the basic idea involved in the method of study presented in these pages.

efforts to work faster and to save labor, man devised simple machines which aided in the processes he performed with hand tools. This type of machine was gradually improved and, gradually, too, more and more of the hand tool processes were performed on such simple machines. The characteristics of these machines were: they were light, were made by hand, were made largely of wood, and were run by hand or foot power. This type of machine has been greatly developed and still has a place in small repair shops, lock and gunsmith's shops, and small blacksmith's shops.

As commerce developed and the demand for manufactured products increased, it became necessary to devise means of increasing the output of a man's work beyond that possible with hand tools and hand-aiding machines. To meet this need there was gradually developed a type of machine which would do the work of the simpler machines many times at once. This machine was driven by power. An interesting illustration of this development is found in the growth of the power spinning jenny which had eight spindles. Then this machine was made with sixteen spindles, then with twenty, and finally with one hundred and twenty. Still later there was invented a machine which combined the principles used in two earlier machines, and which could work twelve thousand spindles at one time. Another improvement at this stage of machine development was the increase of speed which was made possible by the application of power. With the introduction of steam power the development of machinery became very rapid. The use of steam made possible not only the driving of machines at high speed, but also made possible the use of machines for types of work requiring great power.

Machine Tools

The larger use of machinery and the increase of speed and power soon brought into existence a great new industry, namely, that of the manufacture of machinery. The new power machines had to be made of metal and it was therefore not practicable to make them by hand. To make such a machine a new type of machinery was soon developed which was called the machine-tool. The machine-tool, because of the exacting nature of its work very soon came to be the most accurate form of machine development. It was in the evolution of the machine-tool that the most wonderful of all types was created, that is, the semi-automatic machine.

The Problems Solved in the Growth of Machines

Modern machinery is not the result of a series of accidental discoveries, nor has it come by sudden inspiration from the brain of genius, but it is the result of painstaking effort on the part of many men to solve very definite mechanical problems. In the earliest machines the problem was to do by means of a machine a part of the hand process. In most types of hand work, material was held stationary and work was done on it by hand tools. In a few instances, both material and tool were moved at the same time, by hand. When machines were invented, one of the first problems to solve was to determine whether the tool or the material should be moved by the machine. In solving this problem, it was found in some cases best to reverse the hand method, in others the hand method was retained. In hand-sawing, for example, the board is held and the saw is fed into it; in the use of power saws, the board is fed to the saw. A different solution of the problem is found in the early types of drill. In this case the old hand process was not changed, except that the drill was attached to the frame holding the work, making it unnecessary for the hand to hold the drill in place. In a later type using power to turn the drill, the hand did just one part of the old hand-tool process, that is, to put pressure on the drill.

In most of the early machines, however, either the work or the tool was moved by hand. In some kinds of work this was the best possible solution of the problem of changing hand processes to machine processes, but in other types of work the need for further improvement was soon evident. For example, when it became necessary to work metals by machinery, it was found that in planing metal and in turning metal, it was very important to have the tool fed at a perfectly uniform rate of speed, otherwise the surface worked on would be marred, or the tool would be injured. To accomplish this, the tool as well as the material had to be moved by the machine, and a definite relation between the speeds of material and tool had to be maintained. In meeting this condition, one of the most fundamental problems in modern machine construction was created, that of the *division and the distribution of power* in a machine. The problem is this: first, a certain amount of power is delivered at some point in the machine from an outside source; second, part of this power must be used to move, at a certain rate of speed, the material upon which work is to be done; third, part of this power must be used to move the tool, or tools, which perform the work on the material. It is evident that the power originally delivered to the machine must at some place, near the point of delivery, be divided into two main streams, one to move the tool and one to move the material; and, that these two streams must unite again at the point of contact between the moving tool and the moving material. Between the point of division and the point of union, each stream will follow very different lines of direction, and it may be necessary to subdivide each in the course of its movements. But whatever changes in speed or direction may occur in the two streams, they must finally come together at the point of contact between the moving tool and the moving material.

To analyze the relation of tool to material in a machine, and to be able to trace out the lines of power from the point of division to the point of union, is to understand the machine, no matter how complicated it may at first appear.

The Method

When a class is to be started in machine work the teacher will do well to give a talk on the development and economic importance of machines, such as is given

in the preceding paragraphs, pointing out some of the notable developments in modern machinery. If the class is a group of high school boys, essays might well be assigned on subjects dealing with the history and development of certain machines such as the lathe, the drill press, the automobile, the gin, the reaper, etc.

Just before beginning the work in the shop each student should be asked to hand in, in writing, or if the class be very small, to give orally the answers to the following questions about the machine he is assigned to:

1. What is the specific work performed by this machine?
2. At what place is the power applied to this machine?
3. Will the power delivered to this machine be used on the material in the same form in which it is delivered? (That is, rotary or reciprocating motion.)
4. Where does the power "flow" from the place of entry?
5. Is there a change of speed, a change in mechanical advantage, a change in direction or any other change in passing to the next unit or mechanism of the machine?
6. Where next does the power "flow?"
7. Where is the first point of division of the stream of power in two or more smaller "streams?"
8. By what mechanical means is this division effected?
9. Is there a decrease or increase of mechanical advantage in either "stream?"
10. What changes, point by point, occur in the two or more "streams?"
11. How are the changes brought about? (That is by gears, cams, belts, and pulleys, linkage, etc.)
12. Where do the two or more streams finally meet?
13. What form has each? (Rotary, rocking, reciprocating, etc.)
14. Can you suggest a possible improvement in the method of entry, division, transmission and final application to the material of the lines of power?

Later when he is ready to work on another machine he should again be required to go through the same form of analysis. If the teacher prefers to make a class exercise of the analysis of each machine the results will be satisfactory, but the best results will be had by requiring each boy to analyze each machine, *by tracing the stream of power from the point of entry to the point of application to the material being worked.*

No opportunity should be overlooked to teach the correct names of all the mechanisms and parts met with in tracing the flow of the streams of power through the machine.

As simple as this whole procedure is, there is no shop experience which will give to the student or to the new worker as vivid an understanding of his machine and do it in so short a time as will this. Perhaps of even greater value is the habit developed of analyzing any machine to be worked with. This is a habit sorely needed by mechanics and others who have to work with machinery.

In the following pages examples of the method of analysis applied to some of the familiar machines are given. Such a study, however, will be of small value unless the student has the machine before him as he makes the analysis.

(To be concluded in March)

Personnel Service for Apprentices in Wisconsin

R. W. Tarbell, Milwaukee, Wis.

THE successful administration of industry centers a great deal around the management of employees. The old idea of efficiency of organization, with its time studies and performance charts, has partly broken down. We are finding out that the individual workman is a major factor in the perplexing equation of production, that so many managers are trying to solve. A proper understanding of the man is of prime importance in the scheme of any business.

A part of the social, industrial, and educational program of Wisconsin consists of the preparation of apprentices for journeymanship. There are many hundreds of boys in the state, who are passing through a period of training, who will soon take their places in the ranks of skilled labor. During this time they experience various personnel contacts. It is interesting to note the purpose of these contacts, how they function, and how they affect the training program. A knowledge of these relationships aids the schoolman in matters of advisement, instruction, and appreciation of the entire problem of preparing young people for industry. The purpose of this article is to discuss the various elements entering into a scheme of personnel service for apprentices in the state. These elements are divided into four groups, with subdivisions.

In considering personnel work for a group of apprentices, it may be well to decide at the beginning, that every person who has to do in any way with the training relationships of the indentured individual, becomes a personnel officer. This may appear at first to be too large in scope. However, when we consider that the apprentice is under the strain of peculiar social influences, and that he is susceptible to a number of contending forces, which may affect his training in a major way, we are rather constrained to admit that this service includes a number besides those formally known as personnel officers. We may now start out to list the individuals who take part in this service and to discuss how each contributes to the well-being and industrial

progress of the apprentice, keeping in mind that each one is to assist in a plan that will more fully prepare boys for positions as journeymen. The discussion will be confined to existing conditions in Wisconsin.

1. Parents or Guardian

During the period of apprenticeship the parents, or other persons with the home interest and influence, have a certain function to perform. It is not defined legally. There is no compulsion about it and they are not commissioned in any way to attend to certain duties. They occupy, however, a strategic position in the front line of defense, for the home influences are often called upon to bolster up a wavering apprentice, who hesitates about going forward with his training. The parents may be the first ones to interest the boy in learning a trade. They are keenly interested in seeing him through to the point of becoming a skilled workman. He does not appreciate fully the importance of holding on, and may come home night after night, determined to quit, only to be encouraged by the home folks to take up the work once more. This is, indeed, a bit of personnel service of far-reaching importance.

2. The Employer

There are several different personnel contacts at the place of employment. We may consider them as follows:

(a) *The Plant as an Institution.* Almost every apprentice soon comes to recognize that his employer, as a company, ranks comparatively high or low, with other industries who have apprentices. There is a certain atmosphere about the place, which either tones up or depresses the boy in his work. While this is largely caused by the attitude of the several personnel officers, who will presently be described, still there may be above this a very evident feeling of interest, emanating from the main office, as a matter of plant policy, coming from people who never come into intimate contact with the boys.

(b) *The Employment Officer.* Some person in the plant is charged with the business of signing up the new apprentice. He represents the employer, in the arrangements that are made, and gives preliminary explanations concerning the job. He is the first induction officer and lays down the basic principles upon which future relations are founded. He makes the first impression, and his actions may give the apprentice permanent ideas, good or bad, about the entire establishment. Also, the organization of the industry is often such that the apprentices have continued contact through the employment office, where their progress and records are checked up. In one large plant, the employment officer at the gate received reports, both from the shop and the vocational school, concerning the progress of apprentices. He was the one who administered discipline, as occasion arose. He kept an eye out for each apprentice and sanctioned the requests of the boys for changes from one department to another.

(c) *Special Apprentice Foreman.* In many industries there is an individual charged with instructing the apprentice in his various shop activities. It is his business to see that each boy receives proper training in regular sequence. His actual functions vary in different shops. In some places he is held responsible for a considerable amount of production work. He is virtually a production foreman, in charge of apprentices, and whatever personnel functions he has are incidental, simply a by-product of the day's work. He is, of course, held responsible for the regular behavior and correct work of the boys, which is quite a bit of personnel responsibility. In other places his main business is to see that the boys proceed correctly through their training period. He is not primarily concerned with production, but puts in his time seeing that the boys are instructed properly. Such an officer frequently takes the side of the apprentices, represents them in their relations with the employer, much the same as an attorney defends his client, and insists on a proper training program for each boy. He may even take the place of a mentor and plan a course of home study for the apprentices. He may start them on a program of making a notebook of shop kinks, or may get them interested in starting a savings account. The work of this officer extends to the homes of the boys, depending of course on the type of man who holds the office. Altogether, here is an opportunity for personnel service that should not be estimated lightly.

(d) *Various Plant Foremen.* The boy cannot always remain under the kindly tutelage of an apprentice instructor, carefully secluded in a corner of the shop. He must prepare to produce, and that as soon as possible. He must go out into the different departments of the plant, assume his place as a workman, give and take with the rest, and shoulder his share of the responsibilities. He must, perforce, work under the direction of different foremen, get acquainted with various methods and types of people, and learn to take his place in the world of work. A plant foreman may, unfortunately, have so many other duties that he cannot give the proper supervision to the training of apprentices under him. There are plants which have no special apprentice instructor. The boy is assigned to a certain department, for a time, and must look to the department foreman for counsel. It is readily seen that this condition results in all sorts of personnel contact, good, bad, and indifferent. The blame should not be laid at the door of the foreman, entirely. He may be willing to assist, but the plant organization is such that it is impossible to attend to this duty. Where the foreman is a competent instructor, is willing to take on this work, and can find time to do it, the apprentice will receive a splendid training. The foreman may also do a considerable amount of advising, along the lines of personal interests of the apprentice. This part of the personnel service could be developed a great deal, and likely will become more prominent, as foremen receive more scientific training for their jobs, and plants are organized in keeping with this purpose.

(e) *Journeymen as Shop Instructors.* One of the big things about management is proper delegation of duties. It is essential to find people to do things, after the jobs are outlined. In a busy plant the foreman may be charged with the responsibility of instructing the boys in his department, but the actual teaching may be turned over to one of his journeymen. It is beside the point to discuss this function here, as a teaching process. There are activities of a personnel nature, entering into these relations between master and learner. Here is an important feature of the training program. The type of journeyman, who is selected to train the apprentice often determines, to a large extent, the characteristics of the future mechanic. We need only mention the fact that shiftless instructors will make careless workmen. There are other elements, often overlooked, that should be clearly understood by industry. The boy is in a plastic state of mind. He may be only recently through school, and his ideas of the great world will be very academic, to say the least. He is thrust into a shop with entirely new surroundings and strange people. Being susceptible he will soon pick out a hero, from among the journeymen, and set him upon a little throne of his own whimsical fancy. When the object of a boy's admiration is his shop instructor, the more potent becomes this factor. The youth will then blindly follow the line of thought and general philosophy of life of the journeyman in charge. We can at once see possibilities of first magnitude for weal or woe. The boy will cling to his every word. The journeyman may have peculiar, cut-and-dried, notions about economic, social, and moral questions, all of a biased nature, and poison the young man's mind. The result is that the apprentice arrives at his majority, and steps out into industry, as a journeyman, with tremendously distorted ideas about right and wrong, and social justice in general. On the other hand, if the proper type of journeyman is placed over an apprentice, (and this is an end most ardently to be sought), the benevolent influence of such a relationship will have a great effect on the future life of the boy. During the period of many days, or weeks, that this arrangement is maintained, seeds are bound to be planted that will blossom later in some kind of fruit. To overlook the possibilities for personnel work in this direction, or to be careless in administering the details of it, is a mistake which should be laid directly at the door of management.

(f) *Industrial Relations Officer.* The officer in charge of this work is a boni fide personnel worker in the full sense of the term. It is his duty to smooth out the tangles, which develop between people in the plant. He is not a production man, directly, although a clever handling of his duties will increase production a great deal. He is to interpret the viewpoint of capital to labor, and vice versa, and keep the human contacts in good order. Naturally his field is made up of people. He must listen a great deal and give a lot of advice. He must go into the lives and aspirations of people, often to the homes, to get a background upon which to base his program for employee betterment. The industrial-relations-man makes himself familiar with the entire program of activity of the apprentice. He plans to have him in conference often enough to prevent serious interruptions, in his relations with the employer and with other employees. It is scarcely necessary to comment on the fact that this job may be well done or poorly done. It usually works out to good advantage when attended to by a skilled officer.

3. The Industrial Commission

The Industrial Commission in Wisconsin is the agency through which the state is represented in the matter of apprentice training. It is through this body that Wisconsin interests itself in the business of making skilled workmen, concerning certain phases of the procedure. For the purposes of our discussion we will consider several of these functions and discover the personnel activities which affect the lives of apprentices.

(a) *The Deputy, Securing a Contract.* Every legally indentured apprentice in Wisconsin signs a contract to serve during the period of apprenticeship. The agreement is also signed by the employer and by the Industrial Commission. This makes a three-fold interest. The arrangement is consummated by a deputy of the Commission. This officer has certain duties to perform, one of them being the placing of apprentices with employers. The deputy is the field man. He knows his territory, knows the requirements of the different industries, and endeavors to find the right kind of apprentice for each position. Employers rely upon him to secure suitable boys, so that his success, and the confidence he can command among employers, depend to a large extent on his skill and judgment in placing the right boy in the right place. In order to do this the deputy must interview a number of young men, must counsel with them and their parents, assist them in a choice of occupation and employer, such that success will be more certain and, in general, he supervises placement. It is readily seen that personnel service enters into this work as a daily factor.

(b) *The Deputy as an Apprentice Guardian.* The deputy who places an apprentice in a position may have dealings with him thereafter, or he may see very little of him. Another deputy may do the follow-up work. At any rate the service is of a different nature, even though performed by the same individual. There are many little adjustments to be made, as the apprentice goes forward in his training, and it requires the work of a personnel officer. The program of shop procedure may not work out just as the apprentice expected, or he may feel that he is being imposed upon. There may or may not be any foundation for such a belief, but it is a state of mind which prevails with the apprentice. It must be set aright, or there will be a discouraged and disgruntled apprentice. The deputy steps in, looks over the situation, insists on fair treatment, if necessary, and counsels with the apprentice in

the endeavor to straighten out the difficulty. Here is where some wholesome, strong work can be done by the deputy, as he watches the apprentice situation. He is interested in seeing the boys progress favorably and his personnel service, in connection with this phase of the work, is a vital factor.

(c) *The Wisconsin Apprentice Magazine.* The Industrial Commission publishes a monthly paper, of moderate size, devoted to the interests of apprenticeship. This is mailed to each apprentice in the state. The pages are filled each month with articles and bits of information, of interest to apprentices and apprenticeship. It is the official organ, so to speak, which binds all the indentured boys of the state together. In its columns will be found articles by apprentices and former apprentices, by foremen from the industries, and schoolmen throughout Wisconsin. The editors, who are members of the Industrial Commission staff, so shape the material used in the paper, that it becomes, not only an interesting messenger to the boys, but one that will cause them to take more pride in their work. A definite policy of upgrading the morale of apprenticeship is behind the undertaking. In this way the state performs a very worthwhile piece of personnel service.

(d) *Graduation Exercises.* Commencement is a great day in the life of anybody in training. The apprentice is no exception. He begins to look forward, almost from the beginning of his indenture, to the time when he can step out as a journeyman, to take his place as a skilled craftsman. Graduation to him is a red letter day and it will be made more effective by inaugurating suitable exercises. There have been a number of occasions in the state when graduation exercises have been held, or apprentice banquets have been staged. The boys have mingled together, have met and listened to prominent public men, and have been greatly encouraged in their work. Diplomas are distributed to graduates and a general feeling of goodwill is engendered. It will be noted in passing that this is a bit of personnel service carried forward with a well-defined purpose.

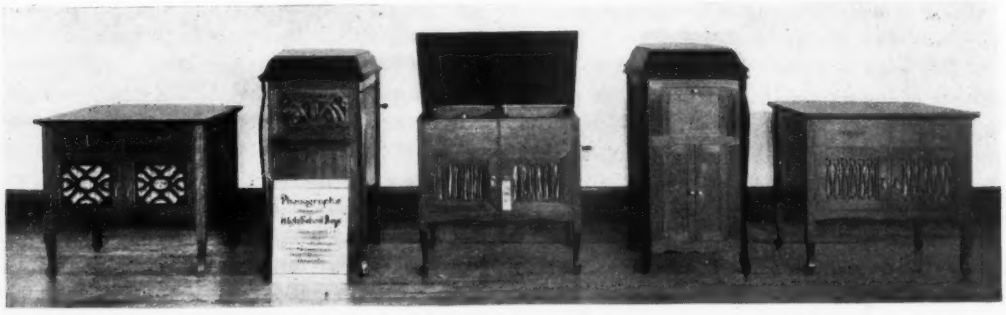
4. The Vocational School

The apprenticeship law in Wisconsin provides that indentured apprentices shall be instructed in certain phases of their trade, during a part of their apprenticeship. The vocational school is the place usually designated as the agency for giving the instruction. The apprentices come to school on a definite program and are in contact with instructors who understand apprentice problems and difficulties. The work of the school falls into two lines of activity.

(a) *Instruction.* This is the chief purpose of the school. Here the apprentice receives the technical information pertaining to his trade. There is, of course, a certain amount of personnel service performed by the instructors in connection with the formal school work. Apprentices do not always understand how to map out their work or how to choose courses. The instructors render them valuable service in this respect. It is personnel work of a technical nature. A few minutes of advice at the right time will appear in later years in improved workmanship.

(b) *Counselling.* Another part of the instructor's work is counselling. This is aside from the other counselling, already mentioned, and does not appear as a formal part of the school program. The apprentices often bring their personal problems to the teacher. The nature of these varies, from questions involving family and home, to matters of economics, shop relations, and life ambitions. The instructor lends a kindly ear and does what he can to steer the apprentice right in his thinking. It is not a difficult matter for the instructor to gain the confidence of apprentices. They soon find out that they can confide their personal questions in him and be treated in a sympathetic, sincere, and satisfactory, manner. In the quiet of the school atmosphere some very effective counselling can be accomplished.

Conclusion: It is thus seen that all persons, touching the apprentice at any point in his training, have an opportunity to do personnel work. This is not always done as well as it could be. There are opportunities for improvement all along the line, as better technique is developed. Scientifically trained men, in all the activities that have been discussed, will do much toward improving apprenticeship.



PHONOGRAPHS MADE BY STUDENTS IN THE INDUSTRIAL EDUCATION DEPARTMENT OF THE HELENA, MONTANA, SCHOOLS. MR. FRED O. ROBINSON, DIRECTOR OF INDUSTRIAL EDUCATION.

General Purposes of Industrial Work for Boys in the Junior High School

Lynn E. Stockwell, Trade and Industrial Department, College of Education, University of Minnesota, Minneapolis, Minn.

WHEN planning a course of study in any subject, but more especially in an industrial subject, one must know in just what direction the course is leading or rather, what the aim of the course is. The aims of an industrial course determine to a great extent what the content of the course is to be, and the extent and kind of equipment to be used. There has been a general criticism afloat that industrial teachers had no definite idea as to why they were offering industrial work in the public schools and the primary purpose of this study is to find some basis by which the validity of this criticism can be tested.

The questionnaire method was used to make the study and the nine aims as set up were placed on the questionnaire as follows:

1. General Training.
2. Vocational Training.
3. Preliminary Vocational Training.
4. Industrial Information.
5. Physical Development.
6. Appreciation of Manual Labor.
7. Training for Recreation or Hobby.
8. Exploratory.
9. Relaxation period.

The nine aims were not set down in any definite order on the questionnaire. The instructions for ranking the aims were as follows: Rank in order of importance, most important No. 1, next No. 2, etc. Cross off those not serving and add any others.

In setting up the criteria for judging the aims for industrial work for boys in the junior high school, books by experts in the field of industrial work or manual training, were reviewed and the aims most commonly used were selected.

The first aim "General Training" means the training for general educational purposes.[1] This aim deals with, not the training of skilled workers, but with the general training of the boys to increase their outlook and broaden their development. The familiarity with several lines of work is emphasized rather than an expertness in one line.

The second aim is "Vocational Training." This aim deals with the training of the boy for a specific vocation. "The need for more practical training is gradually being recognized and schools and courses are becoming somewhat adjusted to meet this need."[2]

The third aim is "Exploratory." Exploratory[3] courses give the boy a chance to try out several lines of work. He browses around to find out which he is best adapted to and which he has the greatest liking for.

[1]Bennett, Chas. A.—The Manual Arts, p. 43.
Buxton, George F.—Manual Training Theory, p. 7.
[2]Ibid, p. 10.
[3]Inglis, Alexander—Principles of Secondary Education, chap. 10.
Koos, Leonard V.—The Junior High School, p. 141.

The fourth aim is "Preliminary Vocational Training." This means the preliminary work leading up to the specific vocation the boy has in mind. "If we are going to have even the beginnings of industrial education, we must reach those that the trade school never reaches, and in other ways than the trade school attempts to reach them. In the beginning it will not be the aim to make finished workmen, but it will be the aim to direct the mental activities of the pupils; to interest them in things industrial; to teach them to think in terms of things and terms of processes of construction and thus make them better fitted to take up the work of a specific trade."[4]

The fifth aim is "Industrial Information."[5] This means teaching the industrial subjects for the informational values and not for the skills which could be derived from the work. Industrial information covers such phases as a knowledge of materials, occupations, manufacturing processes, and a better understanding of industry in general. Industrial information is a great foundation for effective work in vocational guidance. There is a certain amount of overlapping in this aim and the general training aim but the general agreement is that they are separate aims but very closely related.[6]

The sixth aim is "Physical Development."[7] Manual training or industrial training is a part of the scheme for "organic education" which includes gymnastics, athletics, drawing, music, laboratory work in science, etc. It furnishes opportunities for physical activities not had in the classroom.

The seventh aim is the "Development of an Appreciation for Manual Labor." When manual training was first introduced into the public school system of Sweden, Soloman[8] gave the following statement as one of the aims of the work: "To develop an appreciation of rough, honest, bodily labor." One of the most direct results of industrial work well taught is the ability to appreciate the other fellow's job.[9] The American people as a whole have been sadly lacking in the ability to appreciate their neighbors' vocation. This lack of appreciation is due perhaps to the fact that their industrial training has been neglected or perhaps entirely omitted. It is Froebel who has told us that "man only understands thoroughly that which he is able to produce." If we accept this as a fact we see that it is only through mastery of processes, tools and materials, laws

[4]Harvey, L. D.—National Society for Promotion of Industrial Education, Bulletin No. 10.
[5]Bennett, Chas. A.—The Manual Arts, p. 44.
Buxton, Geo. F.—Manual Training Theory, p. 35.
[6]Ibid—p. 35.
[7]Ibid—p. 26.
Pabst, Alwin—Handwork Instruction for Boys, p. 92. (Translated from the German by Bertha Reed Coffman.)
[8]Soloman, Otto—Theory of Educational Sloyd, p. ——.
[9]Cole, Percival R.—Industrial Education in the Elementary School, p. 35.

of construction, etc., that we can completely understand any masterpiece of art or handicraft.[10]

The eighth aim is training for "Recreation or Hobby.[11] The idea of this aim is to instill in the boy a desire and interest for the industrial work so that he will use it as recreation during his leisure hours. This can be carried out very easily at the present time, with the great interest in radio work, which is rapidly flooding the country. The mounting for tuning coils, cabinets for sets, wiring of coils, etc., are a few of the very good problems coming from the radio work and which the boy can enjoy during his leisure time. You hear from all sides that the American adult does not know how to play. Here is a most pleasant way for the coming generation to "play" during their leisure hours.

The ninth aim and last one is "Relaxation."[12] Manual Training is a reaction from the overemphasis upon the bookwork. It gives the boy a chance to get the restlessness worn off and to give the cramped muscles, from sitting in poorly constructed desks, a chance to straighten and become rested.

As stated previously in this chapter, no thought was given to a definite rank order when the aims were put on the questionnaire. They were merely jotted down at random. This was done so as not to influence the returns in any way. The data gathered from the questionnaire is shown tabulated in Table 1.

TABLE I—The Distribution of the Rankings of General Aims in Industrial Work for Boys in the Junior High Schools of the United States by 166 Industrial Teachers in Junior High Schools Scattered over the entire United States.

Aims	Rankings 1	2	3	4	5	6	7	8	9	Total Rank	Median Rank	Final Rank
General Training	86	15	21	12	2	1	0	0	0	243	2.04	1
Vocational Training	9	15	10	7	7	7	5	1	1	226	4.14	6
Exploratory	35	28	11	8	6	2	1	4	0	247	3.00	3
Prelim. Voc. Training	16	20	19	14	8	9	1	0	0	270	3.16	4
Industrial Information	5	54	31	24	11	0	0	0	0	337	2.44	2
Physical Development	1	6	3	5	9	6	6	1	1	182	5.40	7
Appreciation of Manual Labor	4	20	22	21	15	9	6	0	0	365	3.40	5
Train. for Recreation or Hobby	0	2	3	4	11	7	9	6	0	237	6.04	8
Relaxation Period	1	2	3	3	0	2	4	1	4	110	6.30	9

One hundred and sixty-six industrial teachers in the Junior High Schools scattered over the entire United States rated the aims. The rank means the order in which each teacher placed the aims. For example, 86 teachers ranked aim No. 1 as rank order No. 1, nine teachers ranked aim No. 2 as rank order No. 1, etc. This explains the method of tabulation. The total rank was arrived at by multiplying each aim by the number of rankings it received and adding the products. An example follows:

Aim No. 1

Rank		Number of Ranking		Product
1	x	86	=	86
2	x	15	=	30
3	x	21	=	63
4	x	12	=	48
5	x	2	=	10
6	x	1	=	6
7	x	0	=	0
8	x	0	=	0
9	x	0	=	0
		Total Rank		243

[10]Bennett, Chas. A.—The Manual Arts, p. 35.
[11]Buxton, George F.—Manual Training Theory, p. 14.
[12]Ibid—p. 26.
Pabst, Alwin—Handwork Instruction for Boys, p. 86. (Translated from the German by Bertha Reed Coffman.)

After this process had been repeated for each aim, the medians were taken for each aim and finally they were given their new or final ranking.

The last column in Table 1 shows the new rank or final rank for each aim as follows:

Aim number I receives the new ranking of 1, aim number 5 receives rank 2, number 3 received number 3 rank, aim number 4 receives rank 4, aim number 7 recieves rank 5, number 2 receives rank 6, number 6 receives rank 7, number 8 receives rank 8 and aim number 9 receives the final rank number 9.

In conclusion, the following points have been brought out from the data gathered and the discussion of this data:

1. Industrial teachers for boys in the junior high schools have a fairly definite idea as to the aims of their course, as shown in Table No. 1.

2. The importance of the various aims, using the judgments of 166 industrial teachers for boys in the junior high schools as a basis, are shown by the following rankings:

1. General Training.
2. Industrial Information.
3. Exploratory.
4. Preliminary Vocational Training.
5. Appreciation of Manual Labor.
6. Vocational Training.
7. Physical Development.
8. Training for Recreation or Hobby.
9. Relaxation Period.

3. Of these aims, certain ones were not considered of enough importance to rank, by the majority of the 166 industrial teachers, and were either crossed off as suggested or left blank.

The number of judgments for each aim is as follows:

Aim	Number of Judgments
1. General Training	137
2. Industrial Information	115
3. Exploratory	95
4. Preliminary Vocational Training	87
5. Appreciation of Manual Labor	97
6. Vocational Training	62
7. Physical Development	38
8. Training for Recreation or Hobby	42
9. Relaxation Period	20

From the above figures, it can be plainly seen that the majority of the teachers do not value aims 7, 8, and 9 very highly.

It is safe to assume in conclusion that aims 1 to 6 represent the aims of industrial work for boys in the junior high schools of the United States, at the present time, as based on the judgments of 166 industrial teachers for boys in the junior high schools, scattered over the entire United States.

The Out-of-Work Class in the Continuation School

Frederick Ames Coates, Instructor in the Worcester, Mass., Continuation School.

THE Massachusetts continuation school law, in common with similar laws of several other states, compels the attendance of unemployed pupils for a number of hours in excess of those required of employed boys and girls—usually a total of twenty hours a week instead of the customary four or eight, as the case may be. To anyone acquainted with the operation of continuation schools, this requirement presents at once an obvious problem which is as puzzling as it is pressing. It means in effect that part-time education becomes, so far as concerns those pupils who are temporarily out of employment, a contradiction in terms; and the unique organization of the continuation school, by reason of its very success in fulfilling its primary task, is inadequate to function here.

A Difficult Problem.

At first blush it might seem that the out-of-work class, the every-day class, annihilates problems instead of raising them; that it may be handled by a simple reversion to ordinary grammar school methods. Such an assumption is far from correct. The out-of-work continuation school class, it must be remembered, is an ungraded class, and cannot be handled by graded school methods. Moreover, its personnel is constantly changing; when a pupil enters this class, there is no assurance that he will remain in it for more than one day, and, equally, no assurance that he will not be in it for a period of weeks or months. As a matter of fact, Massachusetts experience shows that a month is considerably above the average membership period for this class. It shows, too, that for an out-of-work group to maintain the same personnel for as much as a single consecutive week is decidedly exceptional.

The problem of the out-of-work or twenty-hour class seems to be peculiar to this country. Bavaria, the cradle of the continuation school idea, demands of unemployed minors only the same attendance which it enforces upon their more fortunate brethren. This same lack of differentiation—for school purposes—between employed and unemployed pupils appears to be general in all foreign countries which maintain continuation schools. In London, to be sure, the protracted unemployment situation has prompted an interesting experiment in the way of schools offering full-time instruction to boys who have been thrown out of employment; but these schools are rather in the nature of independent emergency organizations than part of a permanent and regular continuation school plan.

The writer undertook recently, by means of a questionnaire sent to all the continuation schools of Massachusetts and supplemented by personal visits to several of them, to ascertain what lines of attack have been adopted toward this problem, and how successful they have been. It is hoped that the results of this investigation may be of value to all continuation schools which are faced with the need of caring for unemployed pupils on a full-time basis.

Two Obvious Solutions.

There are two obvious solutions to this problem, each of them carrying its own apparent disadvantages. It is in the mitigation or elimination of these disadvantages that the patience, ingenuity and enthusiasm of the principals and teachers become apparent.

First, a special class may be formed and maintained for the out-of-work pupils. By this plan in its simplest form, the twenty-hour class is a distinct and distinctive organization within the school. It has its own teachers, its own classrooms, its own methods—which at first glance would seem to approximate the methods of the regular day school. It is to be remembered, however, that the resemblance to a day school is quite superficial. This class is an ungraded one; its individual members are not normally enrolled for a forty weeks' continuation term, but rather for different short terms rarely exceeding four weeks; the personnel suffers almost daily changes; and as for the numbers, they are so dependent on industrial and accidental conditions that, in a class planned for twenty, they may rise to seventy or eighty, or drop to none at all, within a comparatively short space of time. In at least one Massachusetts city, this possibility became a reality: a teacher employed for the out-of-work class, after struggling with a "peak load," later found himself without any pupils at all. And what of the shopwork in such a class? Shall it be abandoned, because the shops are occupied by regular pupils? Do these pupils need shopwork less than their employed fellows?

A Second Method.

The second obvious disposition of the unemployed boy is to let him remain with his regular class, attending with his own group on his original day, and with other groups in the same department on the other four days of the week. The disadvantage in this is even more apparent: except on one day of each week, any group instruction which is given will be a repetition, to the out-of-work boy daily attending, of what he has had on other days with other groups. He is with the class, but not of it; he is a pariah among his fellows. Merely assigning work to him will not keep him profitably employed. It is idle to speak of completely individual work for all. Group discussion, particularly in hygiene, civics and oral English, is not merely fruitful: it is essential, unless the teacher is to degenerate into a mere assigner of written lessons.

Such are the alternatives. It will be noted that their attendant problems apply more particularly to the non-vocational or "academic" than to the shop instruction. Shopwork, whether carried out by the individual project method, or by the more usual class project

method, demands less homogeneity of the group. The simplest manual operations of a trade demand so much time in their mastery, and furnish, with their muscular outlets, such magnets for individual attention, that each pupil is always, from the instructor's standpoint, a separate class. Indeed, use of the shop equipment renders it impossible for the work to be anything but purely individual. A class of fifteen machine-shop boys cannot all operate milling machines at one time, lathes at another time, and unanimously apply themselves to bench work at still another. In the classroom, however, the situation is different.

It is not amiss to mention that the two solutions referred to are more appropriate, respectively, to two classifications of continuation schools. Small schools are practically prohibited by their size from attempting to maintain a special class, so they must embrace the first alternative. Large schools, with many teachers and shops, and with pupils in attendance at all hours of the school week, can more effectively employ some form of the special-class method, and most of them do.

Special Class for the Twenty-Hour Pupils.

Four of the largest continuation schools in Massachusetts have adopted practically the same plan for a special class. To quote the director of one of these schools: "The program is so arranged that teachers in the different departments have about four-fifths of their time tied up with regular pupils, and in the remaining one-fifth do their turn with the out-of-work class." The twenty-hour pupils receive shop instruction, and its concomitant academic work, in several shop departments each week. This constitutes a prevocational feature which the directors of these schools unanimously indorse as a valuable thing. Even a boy whose original shop course is based on his own deliberate choice, profits by prevocational experiences. Not only is the boy's choice not necessarily a final or an ideal one, but since the school can offer but five or six of the myriad occupations, it may be his second or third choice instead of his first.

The actual arrangement of these special classes can best be based on local conditions. One plan is assigned all regular working pupils to morning classes, and ran the twenty-hour classes in the afternoons. This plan incidentally gave excellent opportunity for "make-ups," since an absence incurred by a twenty-hour pupil could be made up on any morning by going into any of the four-hour classes which happened to be then in session.

A great advantage of assigning the regular teachers to this class, instead of having a special staff, is that it obviates the trouble which always arises when two shop teachers use the same equipment at different times. On the academic side the teachers would not be overburdened, since each one, having the twenty-hour group but once a week, could use with it substantially the same lesson material which he had planned for his four-hour classes.

By no means the least of this plan's advantages is its flexibility—always a desideratum in a continuation school. If the out-of-work group becomes too large to be handled as a unit, two or more of the shops, with their allied classrooms, might be operated each day during the twenty-hour class period. This would mean, of course, extra time on the part of the teachers; but that time could, during the temporary exigency, be deducted from the hours which are assigned to each teacher for "follow-up" work. In any case, the problem of fluctuating numbers is an ever-present one; and this seems to be as practicable a solution of it as any.

Another Type of Class.

A totally different sort of special class for out-of-work pupils is maintained by one successful school in the state. Upon losing his certificate, a boy drops his regular shop and class work, and enters a class with special teachers and a special curriculum. This curriculum puts considerable emphasis on vocational guidance. For shopwork, mechanical drawing is given, on the theory that this is a subject which is not entirely divorced from any of the trades taught in the school. The provision which this school makes against the possibility of dwindling numbers in this class is exceedingly ingenious. New Pupils upon entering the school are enrolled with this group, and left in it for periods up to a month, before being assigned to the regular shop classes. This group is thus a combination of twenty-hour class and "reservoir" class.

This means, of course, that it contains both daily and weekly pupils; but the disadvantages of the arrangement are mitigated by the fact that the lessons can be planned primarily for the daily pupils instead of for the others; and by the further fact that both classes of members have a normal expectancy of but a few weeks here, instead of many months; thus the instructors are not called upon to devise lessons for two hundred days, since a set of forty or even less can be utilized over and over again with a changed personnel. The chief advantage of this plan, however, lies in its almost automatic adjustment of the numbers. When industry is employing many boys, the out-of-work contingent becomes smaller, while the new entrants to the school increase in numbers. In times of business depression, when the twenty-hour pupils are more numerous, the entrances drop towards zero, thus furnishing a balance. It would require very exceptional conditions to either swamp or drain a class organized on this basis.

Leaving Twenty-Hour Pupils in Regular Classes.

Nearly all the smaller continuation schools are compelled, and some of the larger ones choose, to leave the out-of-work pupils in the regular classes. Some of these schools made no statement as to how duplication of lessons is avoided, though they had felt the force of the problem. In many cases the same set of lesson sheets as was used for the regular four-hour pupils was placed in the hands of the out-of-work boys, simply allowing them to go through the lessons at their own pace. But a boy out of work for a period of four weeks

—by no means an abnormal length of time—will under this system at average progress exhaust twenty lessons, or one-half of those planned for the entire year's work. This means that a much larger number of lessons must be planned; and few if any schools have as yet made adequate provision in this direction. As one principal expressed it, such a series of lessons "will come with the millennium."

It must be remembered, too, that a lesson sheet is a basis for teaching, not a device which renders teaching unnecessary. To hand an unemployed boy a lesson sheet and leave him to his own devices, is to invite him to waste time. The group discussions, already familiar to him, have lost their power to interest, but not their power to distract. Two schools give drawing as "busy work" to twenty-hour pupils during the time that the rest of the class is orally engaged. It may be doubted whether drawing is, of all subjects, the best to occupy a pupil's mind to the exclusion of outside influences. At any rate, it could be made to occupy a disproportionate place in the curriculum.

In one school an attempt was made to segregate the twenty-hour pupils without altering the class schedule. On any given half day two classes report to each department. One of these is in the shop for the first period, the other in the classroom. At the end of two hours, the classes exchange places. Instead of having twenty-hour pupils in both these classes, it was arranged that they should form one of the two groups, and that the four-hour boys should compose the other. This meant that the teacher was at least able to deal with his twenty-hour pupils as a group, and to plan oral lessons for them. It did not relieve him from the need of planning extra lessons, but it did abolish the situation of having in a class several silent onlookers. However, the plan was feasible only during a time of depression when the twenty-hour pupils were approximately as numerous each day as the four-hour boys.

Perhaps the best plan is one which attempts, instead of segregating the twenty-hour pupils, to make such segregation unnecessary. In the subjects in which group instruction is employed, the lessons for the year, forty in number, are divided into five groups of eight lessons each. No one of these groups is a prerequisite to any other, though within each group some progression of content may be attained. At the beginning of the school year, the Monday class starts on Group One, the Tuesday class on Group Two, and so forth. For eight weeks each class is occupied with its original group of lessons. At the end of this time, every one of the forty lessons has been presented, and no one of them twice. A twenty-hour pupil who has been sitting with the classes during any part or all of these eight weeks has had no repetition whatever.

Then a simple shift is made. The Monday class starts Group Two, which is new to it; the Tuesday class Group Three, and so on through the five classes of the week. At the end of the year, with a similar shift every eight weeks, each class has covered the entire forty lessons.

Not until a twenty-hour pupil has been in attendance for eight full weeks does he begin to find lessons which he has had before. Since eight weeks is a decidedly abnormal time for a pupil to remain out of work, this contingency may be slighted. Even in such a case, however, the repetition of a lesson after several weeks is a far different thing from its repetition on five consecutive days. It may possess a very definite value as review.

An incidental advantage of this plan accrues to the regular four-hour pupils in the classes. A boy who has incurred an absence is required to make it up by extra attendance. This means that in the week of his make-up he attends twice: once with his regular class and once as an extra. If the five classes of the week pursued the same lessons, he would get them twice in that week. By this plan there will be no repetition in his work of the two days.

Other Methods of Handling Twenty-Hour Pupils.

Not all schools have embraced definitely either of the two alternatives which have been discussed. One large school combines the two methods: it leaves unemployed pupils in their regular shop classes, but maintains a special "academic" class for the out-of-works from all the departments of the school. This class rises to formidable proportions at times. Its teacher is connected with no other class in the school; and its curriculum is a special one.

Another school leaves its twenty-hour pupils in regular classes until their numbers rise to a certain level; then a special class is formed for them, and maintained until the numbers drop, when it is discontinued.

Several of the smaller schools find it out of the question to have twenty-hour pupils at all, since they maintain classes on less than five half-days a week. Some of these schools allow the out-of-work pupils to attend whenever classes are in session, whether it be sixteen hours a week, or twelve, or eight. Among the very small schools, however, the favored practice seems to be to return out-of-work boys to the grammar and high schools, after a grace-period of two weeks, during which they may seek new employment.

Home Economics Cottage. A home economics cottage, 44 feet by 52 feet in size, is in process of erection at Frontenac, Kans. The building, which is to be completed about December first, contains space for four rooms, a laundry, a bath room and a good basement. The building will be erected at a cost of $8,190 and will be equipped at an approximate cost of $2,000.

The purpose of the cottage is to approximate as nearly as possible actual home conditions, and to teach girls home economics and related science and art as found in the modern home. At present, two teachers are giving full time to the teaching of Smith-Hughes courses in classes enrolling 57 girls. The building is the first of its kind in the state and will be used as a practice center for students of home economics in the State Teachers' College at Pittsburg.

Miss Agnes Saunders, part-time supervisor of home economics for the state of Kansas, has been largely responsible for the details in connection with the planning and arrangement of the cottage.

THE AGRICULTURE UNIT OF THE KERN COUNTY UNION HIGH SCHOOL AT BAKERSFIELD, CALIF.
The building and equipment cost $40,000, and was planned by architect Chas. H. Biggar, with the assistance of H. K. Dickson, head of the department.

High School Agriculture in Bakersfield, California

Paul VanderEike, Kern County Union High School, Bakersfield, Calif.

Agriculture in the high school has, within recent years, made progress by leaps and bounds. The old experimental plot and textbook plan has been superseded by home projects and agricultural clubs. Where formerly boys and girls were taught theoretical agriculture, today they are given a personal financial interest in their projects, and made to prove to their own satisfaction that scientific agriculture pays better than the old haphazard, hit-or-miss methods of our progenitors. Boys' and girls' "ag" clubs are now being organized all over the country, and prize contests are being instituted with the result that not only the youth of the present generation are far better farmers, but also their parents are profiting by this movement.

The history of high school agriculture in Kern County Union High School, Bakersfield, California, may be divided into two periods—the period previous to 1919 and that since that year. When the work was begun, about fifteen years ago, it was organized on the old-line experimental plot and textbook plan. A farm, located about a mile from the school plant, was purchased and equipped for experimental purposes in all branches of farming pursued in this vicinity. Such things as building poultry houses, making and laying cement pipe for irrigation, and other tasks involving a certain amount of training, were left to students who sought instruction. The instructor lived on the place, and with the help of an assistant for the unskilled work, had entire charge of it. The work and the instruction were well organized. The ultimate aim, so far as possible, was the application of theory gleaned from textbooks, supplemented by reference books, bulletins issued by the U. S. Department of Agriculture, the University of California, and state agricultural colleges, and the best farm journals of the West and elsewhere.

The resourceful and inspiring teacher, however, for various reasons is tempted to try other fields, and so the inevitable—a change of teachers—often happens. Bakersfield was not immune from such a misfortune, and although the successors of the first organizer were excellent instructors, they were unable to infuse the same enthusiasm that prevailed when the department was first started. This was not due to lack of energy and hard work on the part of the instructors, but entirely due to the fact that the most powerful incentive—individual financial interest in project work—was overlooked. The student of agriculture must be given an opportunity to make money for himself in order that he may be convinced that farming, managed intelligently, is a profitable occupation.

In the meantime came the war and also another instructor. An assistant was employed to oversee the work of the students and to assist in the classwork of the head of the department. A few boys' agricultural clubs were also organized within easy distance of the city. The boys were divided into groups for project work, such as potato growing, grain growing, etc., and merchants were interested to offer prizes for growing contests. Boys, whose parents were opposed to the contests, were allowed a portion of the school farm for their projects, if they so desired. In all such cases the parents had many reasons to be proud of their boys, particularly when they captured a desirable prize.

Three-fourths of the students' time, however, had to be devoted to school work other than agriculture, and to accomplish this transportation from the farm through the heart of the city to the main school plant was necessary. The board of education, realizing that this waste of time and energy, and the high upkeep made the school farm an expensive luxury, sold it to the county for a detention home. The effect of this was twofold: it centralized the instruction, and it placed the project work at the home of the student where it belongs; for if education is to be a success, it must be brought about by the cooperation of parents and school authorities if possible.

The greatest activities and the best results in Bakersfield date from the year 1919, when Mr. H. K. Dickson, the present head of the department, came to the school. That year he organized a pig club with the slogan, "A pure-bred sire on every farm in Kern County." As a nucleus with which to make good their slogan, the club bought a $1,000 Poland China boar from a well-known breeder in Iowa. Most of the boys were without money to finance their projects and their parents were unable to help, so the banks came forward and without security, except chattels on the animals purchased, loaned money for the purchase of sows for a litter contest. The following year loans were made for the purchase of cattle,

priced as high as $500 each for pure breds, and only the best were approved by the instructor. Other students engaged in poultry contests, growing grape rootings, potatoes, etc.

When the work first began, in 1919, the club leader, Mr. Dickson, cast about for some inexpensive method of bringing the work of the club before the people so as to advertise the products the boys would have to sell. Printing a weekly or even a monthly was too expensive; for farm boys have to be taught to be as economical as possible, and so the mimeograph was pressed into service, the school furnishing the paper and the machine which was being used in all departments. The result was a monthly publication, "The Pure Bred Squeals," containing short articles by the boys on their activities and the products they had to sell. This publication, which is still in existence, now has a circulation of over two thousand, and is distributed free among farmers and interested breeders.

At the end of each school year a fifty-page spring bulletin, supported by local and out-of-town advertisers, is issued to tell the world what the department has done that year, and what the club members have to offer for sale. These bulletins have a circulation of 2,500 and are distributed free among prospective purchasers, interested breeders and others.

Registration day in September, 1919, was rather discouraging to Mr. Dickson; for only four students registered for agriculture. Since then, however, the work has grown so much that he now has four assistant instructors, one of whom has entire charge of agriculture in the rural schools, the real feeders of the high school department. The single room in which the first pig club was organized has been replaced by a beautiful building of Georgian style of architecture, erected in 1921-22. This contains two classrooms, a dairy laboratory, a lecture room, a boys' club office for publishing the "Squeals," and a club director's office. The classrooms are large and fitted with side benches for laboratory purposes. The structure is substantially built of red brick, and is so constructed that another story and wings may be added as the department grows. This year a lath house has been erected by a class from the manual-arts department and next fall a green house will be built in the same way.

Commenting on the work in the last "Spring Bulletin," Mr. Dickson said: "During the last four years, eighty boys, members of the Kern County Union High School Boys' Agriculture Club, have borrowed $15,871 to finance individual boys' club projects in agriculture. They have used this large amount of money as capital stock in notes falling due yearly. Up to May 1st, 1923, these boys have paid back $10,450 of their indebtedness. The balance against them, $5,421, is largely in new loans and not due until next winter. Here we have a unique condition. In California, or indeed, in all the United States, there are very few high school boys who have ever had a chance to borrow from $50 to $700 to invest in pure bred stock, as these boys of Kern County have done. From a financial point of view, the fact that the boys are able to clear enough money to pay back the loans themselves, closes all argument as to the soundness of their farming business."

As to the educational point of view of his policy he avers that we cannot teach a very virile type of farming and always stay in the classroom. Fundamentals of feeding, rations, milk testing, etc., can be taught there, "But it is the boy who goes on from this classroom start and buys a fine pure bred cow with his own borrowed money, feeds and milks that cow, sells his own milk or cream, and spends whole evenings trying to make his expense and receipt columns check, who gets the most value from the course. He at once ties up the teaching of the classroom with actual experience with his own cow. And if he does not follow dairying after graduation, his success as a boys' club dairyman will make him more valuable in any line of endeavor."

Another point is that club work teaches cooperation. "The coming years in agriculture are going to be eras of cooperative associations, and our local boys' club is a fit educator to teach by actual practice the value of such a policy. It has held public sales; put on a three-day agricultural fair; published monthly for four years its news sheet, 'Pure Bred Squeals,' and its annual bulletin with a mailing list of 2,500. It has sent carload exhibits of boys' club stock to the state fair at Sacramento, carrying off a substantial number of first and second prizes; it advertises and sells to its members and others, stock and products; it helps to protect individual credits at the banks. These activities have all been accomplished by the club members working together—by cooperation. With such training as a background, these high school boys will grow into maturity ready to put their shoulder to the wheel of any great cooperative farming effort which might benefit them and their fellow producers.

"From an educational viewpoint, the high school through the boys' agriculture club, is trying to set certain fundamental standards. In allowing the rather heavy loans for stock, it is teaching the boys the value of money and the use of capital applied to farming as to other lines of business. It is encouraging investments in high-priced animals to foster an ideal in farming, which, in the end, is true economy for the nation, and it hopes, by training boys to work together, to encourage an intelligent appreciation of not individual problems alone, but a realization of the failures and successes of the group in which the boys work and to which each should lend a hand."

1. ON THE WAY TO SACRAMENTO, CALIF., THE STATE FAIR, WHERE THE KERN COUNTY BOYS SWEPT PRACTICALLY EVERYTHING.
2. LEARNING HOW TO PRUNE GRAPES. BOYS' AGRICULTURE CLUB WORK.
3. ONE OF THE $500 PURE BRED HOLSTEIN COWS OWNED BY EDWARD DEUEL, MEMBER OF THE BOYS' CLUB. THIS PRICE WAS PAID FOR THE COW.

Book Binding, Repair, and Rebinding

Chat. A. Picken, Elementary Shop Teacher, Detroit, Mich.

(Continued from January)

Exercise 11—Reinforcing and Repairing Backs of Covers: The backs are in need of repair, and the first and last sections are loose.

Sections should be reinforced before the backs are replaced. If the stitching has taken up too much of the space, the back can be opened so as to allow the covers to set one-eighth inch ahead of the joint. Repair covers as in Exercise 8 (b).

Exercise 12—Joints: The super is loosely woven cotton cloth, and is glued to the back of the book to aid the stitching in holding the sections together. It extends from the back of the book down on the inside of the covers about one and one-half inches, and is usually all that holds the book in the cover.

The joint marks the place where the cover and printed material come together. The hinge is the swing. To test a hinge swing the cover well back to see that the joint does not give way.

Many of the ordinary school books will, after a short period of use, weaken at the joints. The paper cracks, and often both paper and super loosen. If immediate attention is given to the mending of the book, the stitching does not give way.

(a) Joints where the super is giving way, may be strengthened by stripping. This method should be used only when the sewing is in good condition, and the glue on the back is firm, holding the first and last sections well in place. Cut a strip of gummed cloth or white cotton lengthwise of the goods, one and one-half or two inches wide, and the exact length of the book proper. Apply thick paste to cloth, so it will not stretch and lay pasted side down, one-half on the fly-leaf and the other half on the cover of the book. Rub the cloth down well, so there are no wrinkles. Be sure the cloth fits well up into the joint. Strengthen the fly-leaves and the leaves of the first section to the center fold. Apply paste with a fine brush along the sewing. Insert waxed paper to within one-eighth inch of sewed margin. Place a piece of waxed paper between the cloth joint, just formed, and close the book. Repeat in like manner on other cover. Put under weight to dry.

(b) Another method for strengthening is: (1) Place the book on the desk in an upright position. Open both covers, and note how the back will separate from the body of the book. (2) Apply paste with a round brush between the loose back and the book along the joint only. If too much paste is used, it will spread over the back and will cause the back of the book cover to stick to the book proper, and become wrinkled. (3) Close the book, taking care to push the book as far as possible back into the cover. (4) Then, with a bonefolder, rub down the pasted part well, making the joint fit as closely as when new. If there are any pieces of loose paper along the joint, either paste the paper down well or remove with a knife. If too much paste has been put in, it can be forced out at the head and tail of the book with the bonefolder. (5) Place wires in the joints; then cover the pasted parts with waxed paper, and put back between auburn boards and under weight to dry. Books should be left under weight at least one day.

Exercise 13—Gluing Backs: The super and stitching are in good condition, but have loosened. When the stitching and super are in good condition, the super should be put back in its proper place.

"Stipple" the glue along the back of the book. In closing the cover, crowd the book well back against the super and iron well. Test the joint to see that the covers are in the proper place. Iron down well and put under weight to dry. When the back is dry, paste a strip of gummed cloth along the joint as in Exercise 12 (b).

Exercise 14—Sewing: Repair Sewing. All repair sewing is to be done by hand. Three methods are given below:

(a) Library Sewing or Stabbed Sewing.
(b) Bench or Sewing All Along.
(c) Overcast Sewing.

(a) When the threads are loose or broken, the old threads should be tightened, new threads added on, and the whole made firm by resewing.

Library sewing is a term applied to that type of sewing done through machine made holes; it distributes the strain of the thread more evenly on all of the inner margin of each leaf. This sewing is more durable for books that have been printed on poor material. Library sewing is to be preferred: (1) Where the folds of the sections are badly worn or torn out by the thread. (2) Where hard usage is to be given a book, even though the paper is strong. (3) Where the fiber in the paper is weak. However, library sewing has two faults: (a) It encroaches on the inner margin of the book about one-fourth of an inch, and (b) it makes the book more stiff, and harder to open than with bench sewing.

(b) Bench sewing, or sewing of sections together, one section at a time, is generally done on cords or tapes, and is known as "sewed all along" or "one sheet on," which means that the section is sewed from end to end. Cords and tapes are used in heavy books. Cords are used when the book is to be laced onto the covers, and tapes when the boards are to be split, or they may be pasted down upon the end papers. However, the present tendency is not to depend upon cords and tapes, but upon being properly glued, and the glue on the canton flannel being rubbed well into the back of the book. In general, bench sewing is to be preferred: (1) When a book should open flat. (2) Where hard usage is not expected, and (3) where the fiber of the book is strong.

Machine sewed books may be resewed on cords or tapes. Three cords or tapes for an ordinary eight inch book is sufficient. If cords are used, the saw cuts must not be too deep or too wide. With a coping saw, saw pieces out of the back of the book where the cords are to be, not more than one-eighth of an inch deep, and the same width. This opening should be just large enough to let the cord sink into the back of the book.

(c) Overcast sewing has much the same effect on books as the library or stabbed sewing. Probably ninety per cent of the rebound books are treated this way.

Books, whose folds are in poor condition, should be trimmed off about one-eighth inch, thus making the book into single sheets. These sheets are then glued along the back, and when dry, broken up into sections. Holes are perforated along the inner margin about three-fourths inch apart and one-eighth inch from back edge. The book may be sewed with or without tapes. Sew the first section through the holes, the same as in overcasting end sections. Add another section, and sew back across the book. As sections are added, the sewing should catch two or three of the sections already sewed.

CLEANING BOOKS

Exercise 1—Cleaning Covers

Equipment: Pan for water, sponge, coppered wires, auburn boards, waxed paper and weight (bricks).

Supplies: Water, newspapers (to protect the desks).

Method of Procedure: Cover desk with newspapers.

1. Wet sponge well.

2. Squeeze sponge as dry as possible.
3. Wash book. Rinse sponge often.
4. Set joints with coppered wires.
5. Cover book with waxed paper.
6. Stack books near a window to dry.
7. Weight.

Caution: Never stack damp books in a cupboard. They are apt to mildew.

Exercise 2—Shellacing Covers

Equipment: Brush, heavy cord, cheese cloth.

Supplies: Shellac, olive oil.

Method of Procedure: In shellacing a book, hold it by the pages while applying the shellac. The brush should be well filled. Shellac the covers first, then the back, and lastly the edges when there is only a small amount of shellac on the brush. In shellacing the edges, the side of the brush should be used. In so doing there is no danger in getting shellac on the edges of the leaves.

When the shellac is dry, put a few drops of olive oil on the cheese cloth and rub over the covers.

Exercise 3—Cleaning Leaves

(a) Dry Cleaning. (See General Directions, Exercise 3.)

Equipment: None.

Supplies: Art gum or ink erasers.

Method of Procedure: (1) Hold the page firmly in place with the one hand while you erase with the other.

(2) Always rub toward the margin of the paper.

(3) Brush off all particles of eraser so that none will lodge in the folds of the book.

(b) Washing Leaves. (See General Directions, Exercise 3, (c).)

(c) Mud Stains. (See General Directions, Exercise 3 (d).)

Exercise 4—Sandpapering Edges

Equipment: None.

Supplies: Sandpaper, No. 00.

Method of Procedure: (See General Directions):

(1) Hold the edge of the book firmly between the thumb and first finger.

(2) Wrap a small piece of sandpaper over a block or the finger.

(3) Rub the sandpaper lengthwise along the edge until clean.

REPAIRING BOOKS

Exercise 5—Torn Pages

(a) Pages repaired with gummed tissue. (See General Directions, Exercise 3, a, b.)

Equipment: Shears, pan, sponge and waxed paper.

Supplies: Gummed mending tissue, water, newspaper.

Method of Procedure: Cover desk with newspapers.

1. Cut mending tissue a little longer, and a little wider than the tear.
2. Dampen the torn part of the page.
3. Lay mending tissue, gummed side down, on the torn part of page. "Iron" carefully.
4. Cover with waxed paper.
5. Repeat in like manner on opposite side of page.
6. When work is finished on book, close book and put under weight to dry.

(c) Page Repaired with Tissue. (See General Directions, Exercise 3, c-1.)

Equipment: Shears, tooth pick, or a piece of folder paper.

Supplies: Paste, tissue paper.

Method of Procedure: 1. Apply paste along torn part of page with the finger or tooth pick.

2. Rub down carefully.
3. Cover torn parts on both sides with tissue paper.
4. Rub down carefully along the torn part.
5. When the work on book is finished, put under weight to dry.
6. When dry, pull off loose tissue by pulling with the tear.

(c) Pages Repaired with Paste Only. (See General Directions, Exercise 3, c-3.)

Equipment: Tooth pick or a piece of folded paper.

Supplies: Paste, waxed paper.

Method of Procedure: 1. Apply paste along the torn part of the page with finger or tooth pick.

2. Rub down carefully along the tear.
3. Cover with waxed paper.
4. Put under weight to dry.

(d) Maps Torn Through Printed Material and Margin.

Equipment: Shears, pan, sponge, and waxed paper.

Supplies: Gummed mending tissue, gummed cloth, water, newspaper.

Method of Procedure: 1. All tears through printed matter should be repaired with mending tissue.

2. All margins should be repaired with gummed cloth.

(e) Maps Torn through Fold.

Equipment: Shears, pan, sponge, and waxed paper.

Supplies: Gummed cloth, newspapers.

Method of Procedure: Cover desk with newspapers.

1. Join pages together by pasting gummed cloth on wrong side of map.
2. Sew back in book. (See General Directions, Exercise 8.)

(f) New Maps.

Equipment: Shears, pan, sponge and waxed paper.

Supplies: Gummed cloth, newspapers.

Method of Procedure: Cover desk with newspapers.

1. Cut gummed cloth one-half to three-fourths of an inch wide.
2. Paste gummed cloth along the front margins.
3. Paste gummed cloth along top and bottom margins.
4. Close book and put under weight to dry.

(To be continued)

MANUAL TRAINING MEETS PRACTICAL NEEDS

In line with a statement made some years ago by President Stratton D. Brooks of the University of Missouri, the projects produced in the high school at Norman, Oklahoma, are "useful or conventional or ornamental." Usually the first and the last factors apply to them. The illustration above is a window display showing some of the work done under the direction of Mr. Woodson Tyree. The products were all made during the school year 1923-24.

Hobbies for Old and Young

Chas. A. King.

Happy is one possessing, or possessed by, a healthful hobby; for time seldom hangs heavily upon his hands. And if there are two in a multitude in the clutches of the same hobby, they will as surely drift together as the days come round.

Almost any hobby which brings into play mental and physical activities differing from those of one's daily vocation will furnish the change of interest which brings a rested and reinvigorated mind and body. One whose daily life is devoted to motor activities should acquire a hobby demanding mental exercise—music, literature, chess, or the artistic or theoretical aspects of his motor occupation. Lawyers, clergymen, and members of other learned professions, and business people whose daily occupation is largely mental should open their hearts to hobbies in which motor activities prodominate—motoring, home hand work, gardening, golf, billiards, etc.

While a hobby is of the nature of a safety valve to the adult, it has a far more important function to perform for the growing boy; for nothing can so efficiently develop mental alertness and the habit of concentration as an interest in a hobby to which the youngster will eagerly give his best thought and attention. Such an interest is a far more efficient lubricant of the mental processes, and will more surely establish habits of concentration and of sustained endeavor than will any requirement of the school curriculum, or parental command or persuasion. Interest exists only in the degree of completeness in which the child's mental reaction for the time being is surrendered to the charms of the hobby.

Few boys will be interested in a hobby long at a time; for the congenital type of mind is continually reaching out to express itself in various ways; the mentally-minded boy has no lasting interest in mechanics, electricity, or athletics, while the strongly motor-minded boy cares as little for the scholastic subjects or activities which have no bearing upon mechanical interests. While parental and pedagogical influence may modify the child's environment and methods of self expression, his native endowment cannot be ignored without injury to his development, both mental and physical, and it will surely exercise some degree of dominance in his later happiness and success in life. About eighty per cent of the mass of boys is mentally motor-minded; that is, they have from fair to excellent mental abilities and a correspondingly efficient bent toward motor activities. This is the type of mind which, in the adult, brings to pass the great material achievements which make industrial and commercial progress possible. It also has within itself an impelling urge to live a normal life in which mental and motor activities each have their place; for only thus may mental balance and power be most efficiently developed. Such boys have the mentality to conceive a hobby, and the motor ability to contrive some sort of an equipment.

The preadolescent may enthusiastically embrace stamp collecting and search all the old letters available for ancient issues of postage stamps; but, in a few weeks, perhaps in a few days, his ardent interest has been transferred to cigar labels or automobile plates. This is not necessarily cause for parental assumption that the boy lacks stick-to-it-ive-ness; for even a well balanced adult mind recognizes the need of change in its activities, and usually were it not for the bread and butter urge he would change them oftener. His son realizes no reason why he should continue a self-promoted activity after something else has established itself in his mental processes with an appeal which compels undivided attention. This change in interest occurs because the boy is just a normal boy, curious and investigative. Parents should not lose sight of the fact that he shows initiative by laying out a new line of thought and activity and adapts himself to it by his own volition; this is of far greater importance at this time of his life than to apply a degree of adult perseverance to an activity in which he has lost interest; for the need of so doing does not exist. At this time it is far better to allow initiative, adaptability, and interest to function than to endeavor to force the boy to stick to an activity by the exercise of a trait which belongs almost exclusively to an adult. The home, school, and playground offer abundant exercise for perseverance; but the hobby reacts upon other qualities; parental insistence that he stick to one thing may well result in a loss of opportunity to develop the boy's mind in other equally important directions. Every normal boy has an instinct to try anything once; for he is strongly convinced that his environment needs investigation; incidentally he is acquiring experiences and mental impressions, and is unconsciously allowing his natural bent to discover itself; for his preadolescent and adolescent experiences will become important factors in his decision when he is called upon to select the type of activity which will dominate his life.

It is not wise to purchase a complete equipment for every hobby the boy may embark upon; for the collecting and try-out instincts are characteristic of the normal boy, and not the least of their excellencies is their urge to secure the necessary equipment. At this stage it is the easiest thing in the world for an indulgent parent to make the mistake of doing too much for the boy through the very desire to encourage him. It is far better for the boy to exercise initiative in devising makeshifts than to be coaxed on by having the best commercially made equipment ready to hand; for this is more than likely to have the opposite result.

When the boy begins his manual-arts work at school he will be very likely to make a hobby of wood work; for usually this is the first material in which he works. Here is an opportunity for the organized work of the teacher to bear excellent fruit by being carried over into the life interests of the boy. At the same time the best intentioned parent can throw a monkey wrench into the boy's mental processes by providing him with a liberal outfit of wood-working tools, selected by a friend in the hardware business or by a workman. At this stage the boy is not ready for a complete outfit. It will be better to provide him with as few tools as possible at first, only the simpler tools he uses in the elementary work at school. Other tools may be added as the need arises and he learns to use them. If many tools are at hand the boy will not know their proper functions nor how to use or care for them, hence he will play with them aimlessly; the precious interest inspired by the novelty of possession and the opportunity to meet an immediate need is wasted without result; also the tools are dulled by injudicious use and nothing will more effectively destroy enthusiasm and interest than attempting to accomplish an ardently desired result with tools which will not behave properly. Beside the disappointment, the boy may get an ugly cut—dull tools which will not do what the boy expects of them, are far more dangerous than those in good working condition, and all cutting tools are dangerous if not used correctly. In due time the boy will learn at school to keep his tools in order, but until then, they should be

taken to a workman to be sharpened, or his teacher will gladly help the ambitious boy to sharpen them himself.

It would be difficult to estimate the responsibility of good old St. Nicholas for the mischief which has resulted from buying selected kits of tools bearing more or less of a physical resemblance to the tools the workman uses. To make them more attractive they are contained in a shiny chest. Usually the purpose of their existence is attained when some one's hard cash has been exchanged for them.

The boy's anticipation of his father's bringing home a needed tool, or better still, going to the hardware store himself to select the tool, is an important factor in his interest and enthusiasm. Such tools should not always be full size; for light tools, smaller than adult size are better for his strength, and will fit his hands better. But, in every case they should be of the best makes; for nothing else is good enough for a boy. He uses the best tools at school, and will quickly recognize the difference if the new tools are not of the best grade and will appreciate them accordingly. The professional workman demands the best tools to enable him to work efficiently, hence why should a boy be expected to do what a workman knows to be impossible?

With a modest wood-working outfit the boy has the basic means for making much of the equipment he may need for future hobbies which may obtain a place in his affections. And incidentally he has the incentive for spending leisure hours in the eager indulgence of interest, which results in the application of a degree of concentration unknown in any school or home activity of less pronounced appeal.

The ability to apply a high degree of concentration depends largely upon natural gifts; but whatever degree of such ability may have been the child's congenital endowment, it may be fostered and improved only by using it to the limit. Often the child may appear to concentrate because he fears consequences if he does not; perhaps, he may really think he is doing his best, but his mental attitude lacks the alertness, the unconditional surrender of all psycho-physical powers to the matter in hand. This is possible only in an activity in which his interest, the expression of the fundamental yearnings of his mind finds that which wholly satisfies. Only when this interest, this response to an external stimuli exists, is the mind developing or reacting most efficiently and pleasurably; any subject which does not inspire such reaction lacks the essential interest-impelling elements which characterize a successful hobby.

Manual Training — Vocational and Cultural

Ella L. Bresnehen, Harvard Graduate School of Education

PERHAPS in no subject in the school curriculum has there been so great divergence of opinion, as to the aims to be sought, as in manual training.

One class of advocates claims for it a purely cultural value, while another, who would stress the social-economic side of education, insists that its value lies wholly along vocational lines. Both sides would work through technical skill to accomplish their ends; the vocational advocates to use it for the furtherance of industrial ends, while the cultural advocates hope to develop through it ideals of workmanship along any line and to have it provide for a worthy use of leisure.

The methods employed to accomplish these diverse ends must be different.

Vocational training, to be effective, should develop in the boy sufficient skill to enable him to take his place in an industry as one well grounded in the fundamentals of the trade. To accomplish this end industrial methods must be employed. This means the introduction of machinery, division of labor and other modern innovations. A great diversity in vocational opportunity is also called for, particularly in the centers of population, otherwise the schools will be instrumental in counteracting much of the good which other social agencies endeavor to effect in maintaining an industrial balance. Such education involves a great expenditure of money and time, and is adapted to a chosen few. Most educators would agree that this subject has no place in the course of study below the senior high school. Manual training as vocational training or even as vocational guidance carries with it a danger in the elementary or junior high school. Most of these boys are at a stage of development where self-expression means much to them. Under industrial methods the results (in the way of a finished product) are attained speedily, and with not too much difficulty. The disgruntled or mentally lazy boy may easily be enticed to leave the more irksome but very necessary academic work and prepare for an industry, of the demands of which he has no knowledge, and for which he is poorly adapted. Try-out courses might be used as an incentive to such boys; but they must be of such short duration and necessarily so limited in number that it would seem that their chief value would come as educational guidance. A more valuable aid toward vocational guidance, at this time, might be the study of occupations. Here a wider field and much better opportunity for a full survey of the problems are offered. Supplemented by visits to actual fields of operation, this work would be of value to those children who are to enter industry in the near future, as well as to those for whom work is to be deferred for some years.

This, then, would leave manual training below the senior high school to be pursued along cultural lines. This will differ from vocational manual training in three respects:

1. *As to aim:* The primary aim of this type of manual training will be the development of high ideals of attainment which will carry over into any department of life.

2. *As to method:* All work will be strictly hand work of the craftsman order.

3. *As to product:* It will be chosen primarily because of the possibility it offers for the building up of the above-mentioned ideals.

It has long been argued whether or not there is a carry-over of skill from one muscular process to another. Such extravagant claims were made for this carry-over in the early days of manual training that a reaction set in, and doubts were expressed as to any advantage that might accrue to one muscular process because of skill in another. Dr. Thorndike and other psychologists, however, have proved that there is a carry-over in allied muscular activity. Of course, the greater the space over which it is stretched the less will be its efficacy. To any one familiar with wood-working processes, for example, many that are closely allied with those of other trades and professions are evident, and there is every ground for believing that the carry-over will be great. However, aside from this transference of manual dexterity, there is a correlation that cannot be doubted and that is in the

ideals of workmanship. When we are dealing with children the item of interest is always an important one to be reckoned with. Therefore, when we say that a child who learns to appreciate accuracy, neatness, integrity, or any other desirable quality as he meets with it in manual training, will hold to this ideal in other fields, we must be understood to be presupposing equal interest. Let me repeat that, in my estimation, the development of these ideals should be the primary aim of the teacher of manual training in the junior high school.

The question might well be asked, how are these aims to be accomplished?

The first consideration should be in regard to the choice of teachers. Of course, this consideration is of major importance for any junior high school subject. Therefore, it suffices to say that the manual training teacher in this department of school work, in addition to technical skill, should possess all those qualifications necessary for any junior high school teacher; namely, a good cultural foundation, a normal school training, and a personality that can sympathize with the interests and aspirations of these children, who are on the threshold between childhood and maturity. A teacher whose primary qualification is technical skill may serve as a useful instructor in a department of vocational training with more mature pupils; but he must fail utterly in accomplishing the aims sought in cultural manual training. As I have before intimated, a teacher to be successful in this work, must, first of all, understand and be sympathetic with children of this age. He must also know what they are doing along other lines of school work and be able to cooperate with other instructors. Junior high-school manual training calls not so much for skilled artisans as for skilled teachers.

The attention must next be centered on the best medium through which these ideals can be developed. There has been a loud cry for the making of more useful articles in the manual training room. This cry goes with that for mechanically skilled teachers and vocational training. To be sure social values must be kept in mind in all lines of school work; but when processes which in themselves have a social value are being taught, does it matter whether, for the sake of making them more real, they are combined in an inferior radio set or in a tool rack? To be sure some homes may have greater use for one than for the other, but chances are that most of our city homes need neither. It would be a useless and unsuccessful attempt to try to find for 75 or 100 pupils, during a three-year course, articles which would combine processes which are to be taught logically with actual use value. Indeed, the question of use means little so far as the pupils are concerned; for when given a choice most of them will follow the lead of a few who have enough initiative to make a decision. The novelty of a new tool, or the added use of one that is already familiar, supplies the necessary interest.

The matter of differentiation of model brings up the question of the allotment of the teacher's time. A demonstration lesson ordinarily takes from three to ten minutes during the first two years of wood-working. During the early period of the boy's training, it is difficult for him to associate a process with his work, unless it is shown on the same kind of article that he is making, as there is much detail of planning and measuring to be looked after before the actual muscular work can be started. If a teacher be obliged to demonstrate a process to twenty or more individual pupils, it will mean that the time consumed for that part of the work will be multiplied many times and that left for other necessary instruction and supervision will be curtailed. Such individual instruction must result not only in the waste of the instructor's time, but also in that of the pupils, who need instruction in order to proceed with their work.

There is still another difficulty that attaches itself to too great freedom of choice on the part of the pupil. It is very difficult for a child of junior high school age to appraise his own ability. If he is timid he underestimates it; if aggressive he overestimates it. The mentally alert but retiring boy will foresee difficulties which will magnify themselves because of the newness of the project, and rather than risk failure will shrink from attempting his maximum possibilities. The duller pupil, on the other hand, not being able to foresee the difficulty, will choose a model far in advance of his ability. In the first instance we are sinning against the educational maxim that bids us work each child to his maximum capacity; while in the second case we must either allow the boy to fail in his effort to make his chosen model, or to work under very low standards. If we choose the second alternative we are defeating the aims of cultural manual training.

Taking all these things into consideration, it would seem that the actual use value must be of minor importance in selecting a project, and it should be thought of only in connection with the more skilful and dependable workers who need little individual attention.

Reference to differences in ability leads me to speak of a notion, which is widely accepted but very false, in regard to the intelligence necessary for successful manual work. We often hear a teacher remark in regard to a pupil, "He is very stupid in his academic work; but I think he might do well in manual work." If she means that he might be trained as a machine to complete one or two processes that someone else plans for him, she may be right. A careful comparison of the academic and manual training grades of about 250 junior high-school boys has failed to suggest the existence of any law by which lack of mentality is compensated for by manual dexterity. Technical skill, and by this I mean the ability to plan and execute a problem in accordance with a high standard, goes hand in hand with mental ability. In my estimation this is the only type of manual training for which we have any right to hold a pupil in school. If a child's failure is due not to lack of interest but to actual lack of intelligence, it is an injustice to him and a seeming waste of public money to try to bring about a mechanical adaptation in the false setting of a school-room.

"But," the question might be asked, "why introduce this costly and rather foreign subject into the school curriculum in order to develop these ideals? Can they not be instilled through the academic subjects?" My answer would be that manual training is a truer representation of life's experiences than are these other subjects. Perfection is almost a negligible quantity in the world as we find it. There is a long curve between perfection and failure. Few people reach the height of this curve along any line; but the nearness to which they approach the standard determines the degree of their success. In many academic subjects, as, for example, arithmetic, the child must attain perfection or experience absolute failure; there is no in-between. Then there are other subjects, like composition, in which even educators fail to agree as to when perfection is reached. In both classes of subjects the child may have given little thought or effort to his problem and yet stumble on to, or after many careless trials, attain a result that is commendable; whereas, a child who is careful and conscientious may be doomed to absolute failure. In working with wood these inconsistencies cannot occur. There is a definite standard

of perfection in this work, but failure to attain it means simply failure to reach maximum success. Then there are tests that a child may apply to his own work which will measure definitely the degree of his failure or success, and even temporary departure from high standards are irrevocably recorded on his finished product. At least we can say that no academic subject can be equally effective in pointing out to the child the desirability of high ideals of attainment.

My remarks may intimate that, just as I would restrict vocational training to the senior high school, so would I relegate cultural training to the junior high school. Such a restriction has come about, but it is a great mistake. Cultural manual training has an intrinsic value that seems to increase with the maturity of the pupil. Like other intrinsic values it cannot be analyzed, and it is, therefore, well nigh impossible to convince those in charge of our higher educational institutions, who, themselves, have adhered so closely to training given along traditional lines, of this value.

A Spinet Desk[1]

Margaret Fullerton, Oklahoma College for Women.

Furniture stores offer a choice between two distinct types of writing desks. *First,* office desks in a multitude of sizes and designs to meet the varied requirements of merchants, professional men, bankers, and public officials. This type is distinguished by plain, straight lines, and its perfection of facilities for the scientific filing of information. *Second,* a dozen or more styles and periods of so-called "ladies' desks," chiefly notable for their beautiful lines and total lack of practical arrangements for filing material of any sort.

The first type of desk is unsuited to the home, dormitory, or boarding house room because most women prefer to have their domain *look* like a home rather than an office or classroom. The second serves very well for those whose correspondence is confined to a few personal letters; but is utterly inadequate for college girls, teachers, and housewives whose schedule of home work includes such varied interests as personal and business letters, lesson plans, expense accounts, lecture notes, thesis outlines, and cooking recipes.

The desk shown in the accompanying drawings was designed to fulfill the writer's ideal of one harmonizing in lines and finish with the other furniture of the home, yet possessing really practical arrangements for filing the multitude of letters, notes, and sketches incidental to college life, housekeeping, or a crowded social calendar.

The "Spinet" style was chosen because it seemed to offer better opportunities for incorporating such filing devices than any other except strictly office types; and because it could be drafted into use as a library, tea, or card table when not in use as a desk.

In addition to a filing system adapted to the owner's own requirements, this desk differs from the conventional types in several particulars.

First, in height. The reason for building dining chairs, tables, and similar pieces to standard dimensions, large enough for use by the largest and heaviest guest, is apparent. A like reason for making a piece designed for one individual's use to similar stereotyped proportions was not equally obvious, hence this desk's writing bed is four inches lower than usual. This might not add to the comfort of "Mr. Average American's" five foot ten inch frame, should that mythical citizen wish to sit at the desk to write a letter, but it does enable the desk's five foot one inch owner to work at it with both feet touching the floor.

The desk could, of course, be made to standard height by simply increasing the length of the legs.

Second, in possessing a unique lighting system which assures a good light exactly where needed. This consists of a door with art glass panel (Figure 8A, Number 4) hinged at points "1" and "2" to the front vertical piece of the desk's inside frame (Figure 6A). A board dadoed into and at right angles to the back of the door carries an electric light socket in such a manner that the long axis of the bulb (Figure 8A, Number 5) is parallel to the glass. A bright tin reflector is bent over and back of the bulb to throw its direct rays onto the writing bed and away from the writer's eyes. The light wires are brought through the hole shown at Number 3, Figure 8A, across the back of the board to the corner formed by its juncture with the back of the door frame and hence through holes to the bottom of the desk where a socket is located for connection with the house lighting system. An ordinary two button wall switch is also located under the desk where it is easily reached to turn the light on and off.

A substitute for the art glass panel, and perhaps preferable to it, is a sheet of parchment protected by a piece of clear glass. This can be colored by floating over it thin coats of transparent oil paints in any harmonious color combination. Beautiful leaded glass effects may be produced by painting designs upon the parchment with the transparent oil colors mixed in turpentine and Japan dryer. Each part of the design should be heavily outlined in India ink before applying the paint.

The glass door is shown installed in the desk at "A," Figure 2.

Third, in possessing four roomy secret compartments shown at 'E," "E," Figure 3 and 'F," "F" Figure 6. These solve the problem of protecting valuables which must be kept at home. Marauders know all the usual hiding places and are only momentarily delayed by locks and bolts, but are unlikely to ferret out articles concealed in compartments whose existence is as successfully camouflaged as these.

Entrance to the hidden compartments at the left end of the desk is gained by swinging the lighting unit (A, Figures 2 and 8) open on its hinges. This reveals a space in the base section of the desk (between the end rail and the drawer guide) 3"x7½"x26½", and in the upper section (at the end of the pigeon holes and behind the lighting unit) 7½"x8"x14". Turning the ink bottle cabinet (Figure 8, Number "B") upon its hinges out over the writing bed discloses similar spaces in the right end of the desk.

The doors to these secret compartments (the lighting unit and the cupboard) are firmly held in their closed position by cleverly concealed locks, the details of which are shown in Figure 7. These locks are extremely simple and sturdy in construction, positive in action, and after being installed require no further attention or adjustment.

Each lock consists of a locking-plunger ("A") projecting through the lower rail of the desk's inside end frame ("A" and "B," Figure 6), an operating pin ("B," Figure 7) projecting through the bottom of the desk and connected to the locking plunger through the lever "C" by means of axis pins "E" and "F." The lever works upon pin "D" as a fulcrum, the latter going through the

[1]The detailed drawings will be found in the blue-print supplement which is a part of this issue—Editor.

lever and mortise "P," and being cut off flush with the outer surfaces of the drawer guide ("L," Figure 7). The upper inch of the operating pin is turned down to one-quarter inch diameter as shown at "G," Figure 7A. A stout coil spring is wound about this part of the pin with its upper end pressing against the wood at the top of the hole in which the pin works. The lower end of the spring bears against the shoulder near the upper end of pin "B." It is, therefore, apparent that the *downward* pressure of the spring at "G," when transmitted through the lever "C," becomes an *upward* pressure upon the locking-plunger "A," which is thus held with its upper end projecting through the rail of the desk frame (Figure 7, Number N; Figure 6, Numbers A and B), and three-eighths of an inch into the lower edge of the lighting unit door and of the ink bottle cupboard.

The lock is operated by pressing upward upon the lower end ("J") of the operating pin "B," which results in pulling the locking plunger "A" down and out of engagement with its mortise in the bottom of the door or cupboard above, permitting the latter to swing open and disclosing the secret compartments.

The danger of the lock's secret being discovered is minimized by planing and sanding the lower end of its operating pin smooth and flush with the surface through which it projects, and by placing a number of similar dowel pins (ostensibly to fasten the bottom of the desk to the drawer guide) in a row with the operating pin.

The construction of the various units included in the desk is shown quite clearly in the detailed drawings, and requires no explanation beyond that found under "Names of Parts," but a word concerning the method of assembling might not be amiss.

The main part of the desk consists of five units shown at "A," "B," "C," and "D," Figure 1 and "C" in Figure 3. The writing bed runner frame, which is seen at "D" in Figure 1 as a square edged mounding at the top of the posts, and the details of whose construction is shown in Figure 5, is fastened to the lower edges of the top unit (Figure 6) by means of flat-headed screws and glue. The top of the desk (Figure 11) is fastened to the top edges of this same unit by cleats and screws supplemented by glue. The upper and lower sections of the desk are fastened together with glue and quarter inch stove bolts running the writing bed runner frame and the cleats shown at "D" in Figure 3. The locks for the secret compartment doors are next put in place, after which the bottom panel (part of which is shown at "C" in Figure 3, and in detail in Figure 4) is fastened to the lower edges of the drawer guide ("B," Figure 3) by flat-headed wood screws. The folding lids are fastened together and to the top of the desk by means of piano hinges, while "Soss" invisible hinges are used for attaching the lighting unit door and the ink bottle cupboard.

Inlay seemed particularly desirable as a form of decoration for this piece of furniture, and designs are shown in Figure 12 for application to the different parts.

Three kinds of wood are required for these designs. In nearly all cases it is found most satisfactory to use for the light colored parts of the design, some wood slightly lighter than that used in the construction of the desk; for the darker parts of the design, some wood a little darker than the background; and for the dots, ebony or some other very dark wood. American black walnut being used in the construction of this desk, a satisfactory combination for the inlay was found by using Circassian walnut for the light parts of the design, rosewood for the darker parts, and ebony for the dots. For a mahogany desk, the inlay may be done with satin wood, American walnut, and ebony.

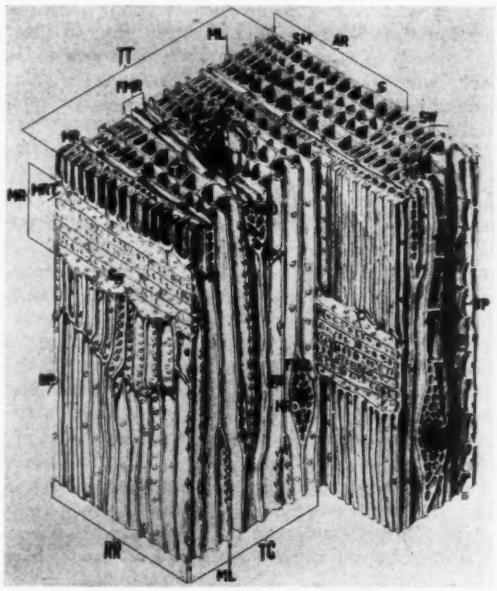
"A" is the design for the corners of the top of the desk. This was placed at each corner about three inches in from the edge and the end.

"B" is the panel for the center of the front lid shown at "E" in Figure 1. The bottom of the design was placed about one inch above the bottom of the lid. When the desk is open and this part folded back, it forms an attractive panel across the back of the desk.

"C" was applied to the corners of the writing bed about 1½" from the front and edges of the board.

"N" is the unit of decoration for the upper parts of the legs.

The inlaying of this pattern is simplified by the fact that the design is so planned that it required the sawing of but three different shapes and the turning of three sizes of dowel pins for the dots. The great variety of the pattern is gained by the ingenious use of these few simple pieces in different arrangements.



CELL STRUCTURE OF A SOFT WOOD.

This drawing of the cell structure of a minute block of softwood—White pine—was made by a wood technologist at the U. S. Forest Products Laboratory. The microscope cannot bring several planes into sharp focus at the same time as does this drawing, but it was by means of studies of various thin sections with the microscope that the drawing was accomplished. The drawing here shows a cube less than ¼ inch on a side.

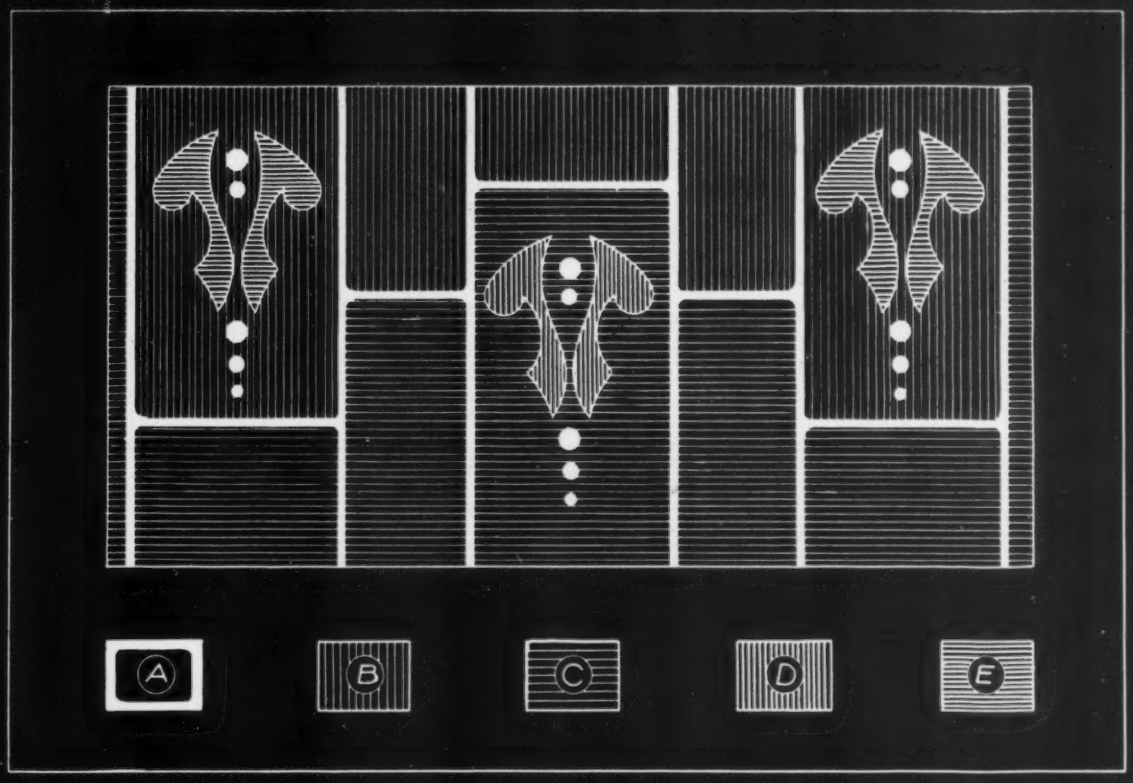
Wood, instead of being a relatively solid material like steel or concrete, is seen to be composed of many tubular fiber units or cells cemented together and having on their walls thin areas to permit the passage of the sap.

The top of the block represents a plane parallel to the top surface of a stump or the end surface of a log. The rectangular units which make up this surface are sections through vertical cells, mostly tracheids or water carriers, TR, the walls of which form the bulk of the wood substance. Between the various cell units is a cementing substance called the middle lamella, ML. Springwood cells S, distinguishable by their greater size, and summerwood cells SM are formed during the early part and the later part of a year's growing period, respectively. The growth of the springwood is the more rapid. Together the springwood and the summerwood cells make up the annual ring AR. One such ring is added to the outside of the tree each year.

The function of the medullary rays MR is to store and to distribute horizontally the food material of the tree. These rays—including the fusiform medullary rays FMR, or rays having horizontal resin ducts HRD, at their centers—are found on the end of a stick as fine white lines radiating from the center. The large hole in the center of the top surface is a vertical resin duct.

The left side surface RR represents a vertical plane along the radius of the trunk. This surface—commonly called "edge grain" in softwoods and "quarter-sawed" in hardwoods—is not so distinctively marked in the softwoods as in the hardwoods. In some hardwoods, the "quartered" surface with its large lustrous flakes" formed by medullary rays entering and leaving the plane of the saw is valued for use in furniture because of its attractive figure.

The symbol SP indicates a simple pit, an unthickened portion of the cell wall through which sap passes from ray cells to fibers or vice versa. The bordered pits BP, seen in section on surface TG, have their margins overhung by the surrounding cell walls. The surface TG, at right angles to the radial or quarter-sawed surface, corresponds to the flat grain or plain-sawed surface of lumber. (Photograph by Forest Products Laboratory, U. S. Forest Service.)



A Spinet Desk

Margaret Fullerton.

(See Page 56 for Descriptive Article.)

Names of Parts

Figure 1.

- A. Lower section.
- B. Upper section.
- C. Top.
- D. Writing bed runner frame.
- E. Folding lids.
- F. Drawer.

Figure 2.

- A. Lighting unit.
- B. Pigeon holes.
- C. Writing bed.

Figure 3.

- A. Details of frame construction.
- B. Drawer guide.
- C. Bottom of desk. This serves as runners for the drawer. The space under the drawers is filled with a three-ply veneer panel, making the desk as nearly dust-proof as is possible.
- D. Cleat, through which bolts fastening upper and lower sections of desk together are placed.
- E. Secret compartment.
- M. Back rail.
- B. Ink bottle cupboard.
  - 6 and 7. Hinges.
  - 8. Sliding door grooves.
  - 9. Sliding door.
- C. Details of sliding doors and door grooves.
- D. Details of Sliding Door Tongues.
  - 10. Ball bearing set in a shallow hole in edge of door to eliminate friction in sliding the doors back and forth.

Figure 9. Larger Drawer, shown at "F" in Figure 1.

- A. Outside dimensions of drawer.
- B. Details of one back corner.
- C. Details of a front corner.

Figure 10. Pigeon Holes.

- A. Outside dimensions of pigeon hole unit.
- B. Details of pigeon hole construction, showing method of fastening top, sides, and partitions together.
- C. Details of drawer designed to fill pigeon holes and thus eliminate the untidy appearance of open filing spaces.

Figure 4. Bottom of Desk.

A. Part of frame without veneer panel in place.
B. Part of frame with veneer panel in place.

Figure 5. Writing Bed Runner Frame.

1. Details of mitered mortise-and-tenon corner joints.
2. Details of frame.

A. Writing bed runners.
B. Writing bed runners.

Figure 6. Upper Unit.

A. Left inside frame. The lighting unit occupies the opening in this frame.
B. Right inside frame. The ink bottle cupboard occupies the opening in this frame.
F. Secret compartments.

Figure 7. Details of Lock.

A. Locking plunger.
B. Operating pin.
C. Lever.
D. Fulcrum pin.
E. Axis pins.
F. Axis pins.
G. Coil spring.
J. Projecting end of operating pin.
K. Bottom of desk.
L. Drawer guide.
M. Writing bed runner.
N. Lower rail of inside desk frame (A or B, Figure 6).
P. Mortise through drawer guide for accommodation of lever "C."

Figure 8. Details of Lighting Unit and Ink Bottle Cupboard.

A. Lighting unit.
1 and 2. Hinges.
3. Electric light wire.
4. Art glass or parchment panel.
5. Light bulb.

The details of the pigeon holes illustrated in this drawing are given merely as suggestions, as it is thought preferable for each prospective desk owner to analyze his or her own needs and plan its filing arrangements accordingly.

Figure 11. Top of Desk and Folding Lids.

A. Piano hinge connecting top of desk with top part of lid.
B. Piano hinge connecting top part of lid with front part.

Figure 12. Design for Inlay.

A. Corner design for top of desk.
B. Panel for front part of folding lid.
C. Corner design for writing bed.
N. Unit for top of legs.

Figure 13. Design for Parchment Panel in Lighting Unit.

A. Lines done in India Ink.
B. Flat tint of dull golden yellow.
C. Flat tint of rose color.
D. Brighter and darker shade of golden yellow.
E. Brighter and darker shade of rose color.

For the darker shade of golden yellow, mix with turpentine and a few drops of Japan Dryer, orange yellow transparent oil paint neutralized with a very little blue violet or black until the hue is about one-half intensity, medium value of orange-yellow when applied to paper and held before a bright light. For the background tint add turpentine to this hue—do not attempt to make a lighter value by adding white paint.

For the darker shade of rose, mix as above, using violet-red neutralized with yellow-green or black until it is about two-thirds intensity, medium value violet-red. Thin with turpentine to obtain the tint.

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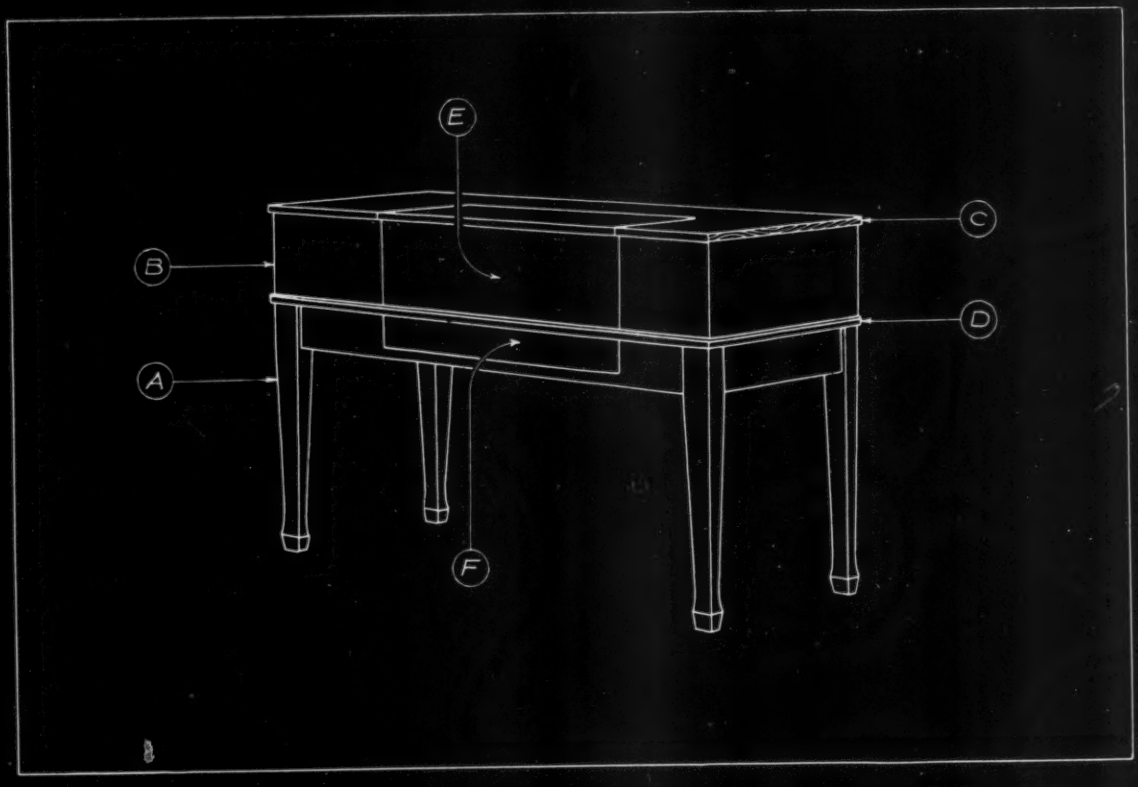
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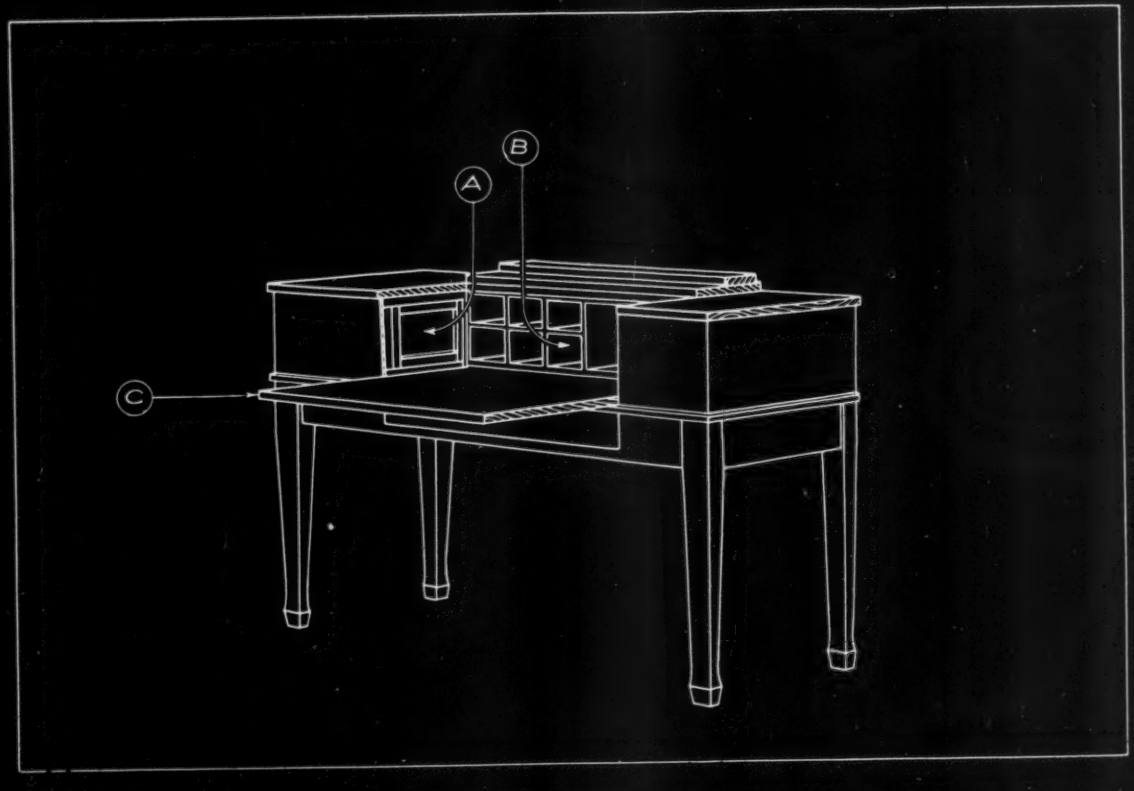
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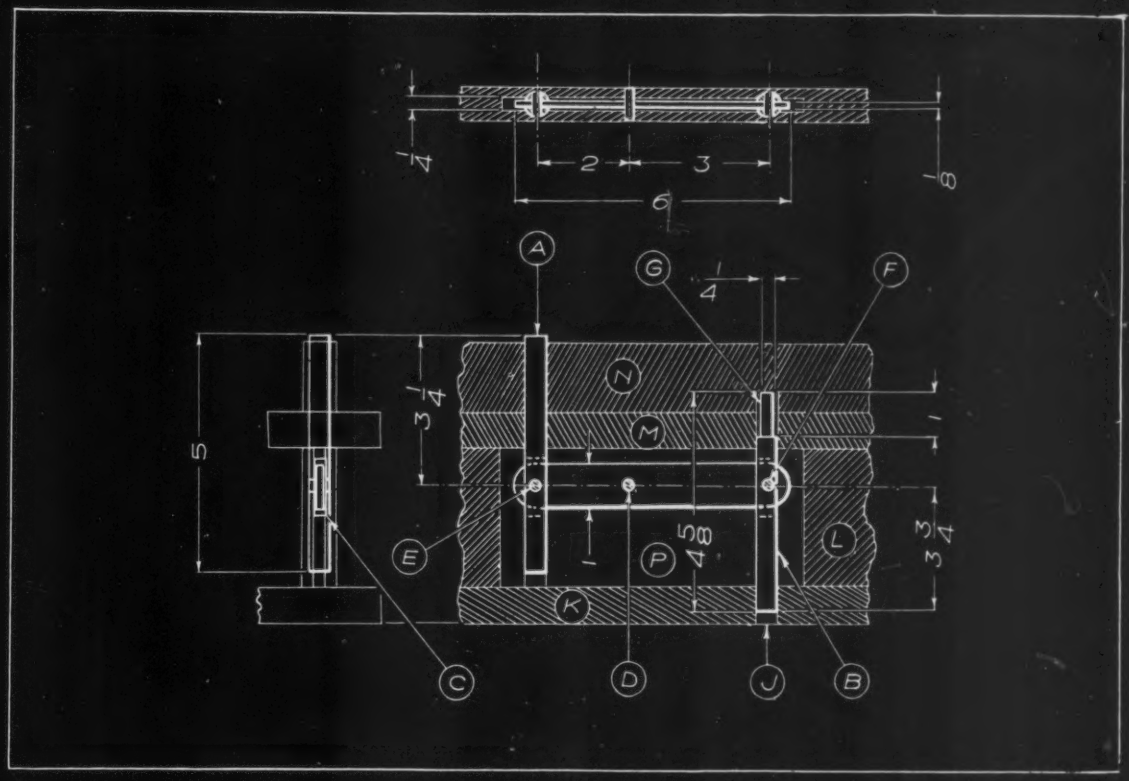
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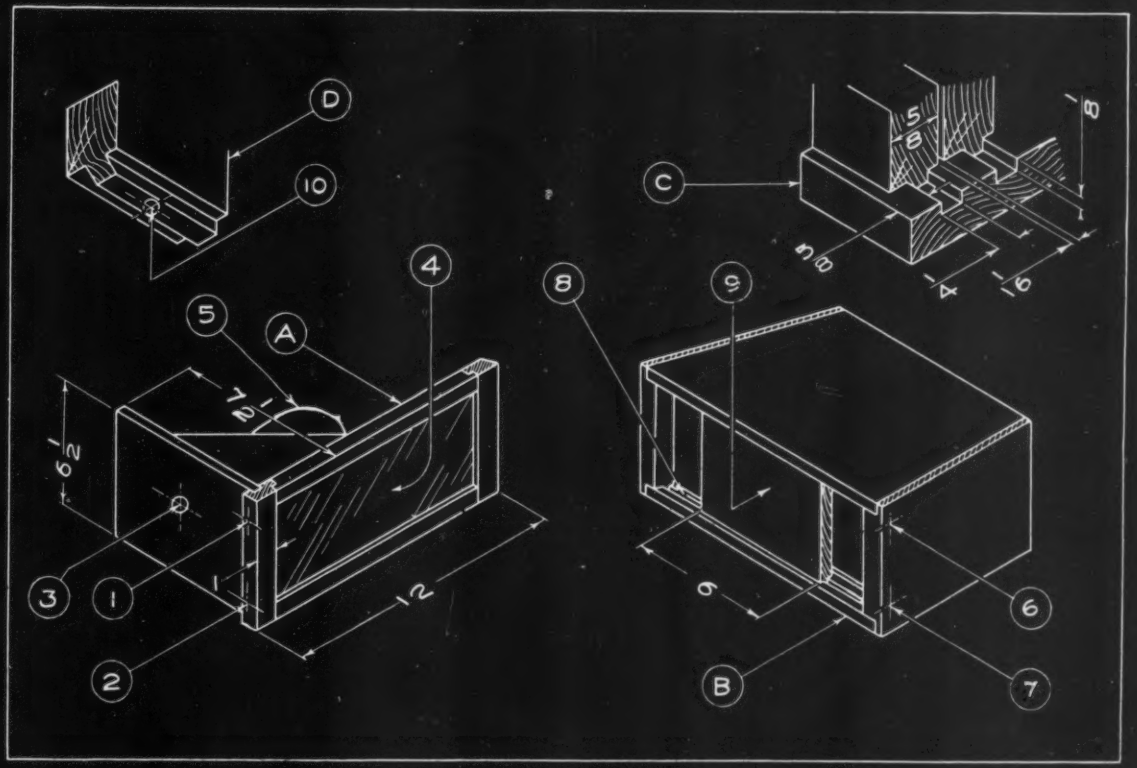
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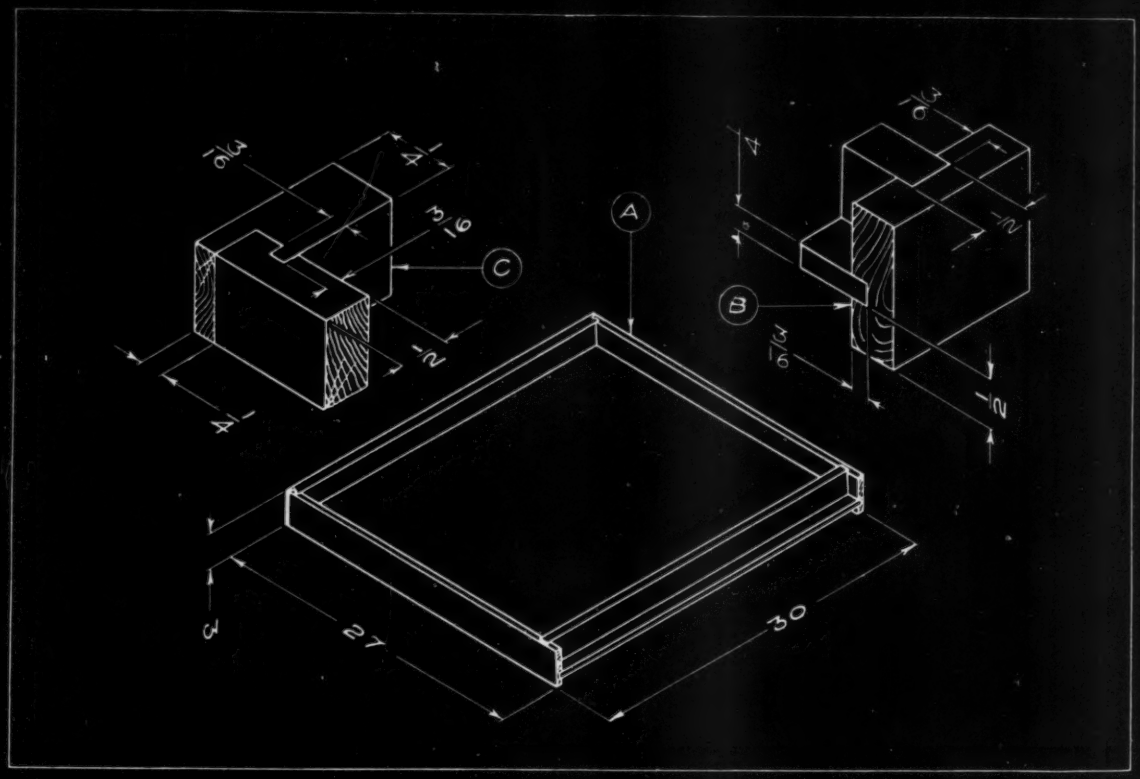
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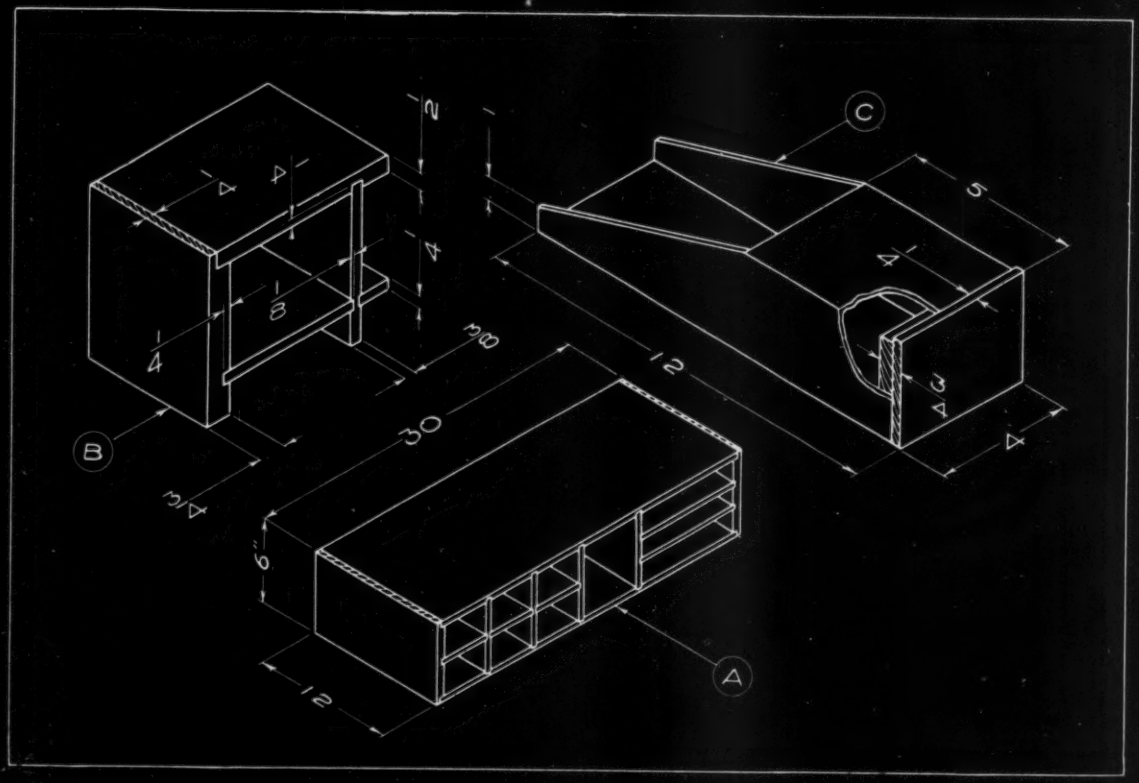
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Related Electrical Drawing

Herbert D. Traub, Indianapolis, Ind.

BY related electrical drawing we understand a species of mechanical drawing having some direct bearing on, or relation to, the electrical field. Without much trouble or thought we realize the extensive range which may be covered in this wording or name. There are as many distinct avenues in electrical drawing as there are in electrical work and construction. A few illustrations might be given such as house wiring, radio, switchboard work, and motor winding.

In treating this subject, I shall deal with it from the standpoint of direct relation with the two-year high-school course in electrical construction given the first two years in the high school.

The aim is to give the boys enough work enabling them to read ordinary electrical construction drawings at the end of their two years. It is impossible to make an electrical draftsman, or designer, in two years of high school, with work covering 45 minutes a day and five days a week. The question might arise as to why we teach drawing when our aim is ability to read blue prints. My answer is this. For a course in blueprint reading, in order to keep up to date, an inexhaustible source of blue print material would have to be located. Most of these prints, even if industry would furnish them, would be too complicated for beginning pupils. Further, industry is not very generous in allowing prints to get out of their possession because of the fear of releasing some of their manufacturing secrets.

One of the first things to be kept in mind is that electrical work is very mechanical. A poor mechanic will never make a good electrical man. He will not fit in any capacity excepting the theoretical, and a purely theoretical man is not of much use to industry. Let me give an illustration of this fact. In a factory in an Eastern city they were attempting to put a new, low-priced, electric drill on the market. It was not working as it should for a successful commercial product. The company's engineers were all good electrical men but not mechanical engineers. They went over the drill thoroughly, rechecked their figures and electrical data, and found it all right. Finally they called to their aid a first-class mechanical engineer and laid the case before him. He replied that he was no electrical engineer and was afraid he could not be of much help to them. They assured him that the electrical part was in good condition but there was something mechanically wrong. With this understanding it was only a matter of a few days until the location of some reduction gears was changed and the drill was a success.

Another important point to remember is that in the drawing room drawing, and not trade practice, is to be taught. True, the application of drawing in the trade must ever be kept in front of the pupil. There must be provided a practical application through which the drawings may be linked up. We must avoid "blind alley" problems for which to excuse ourselves by saying they are good practice. In academic studies, work is often placed in the courses for pure mental gymnastics and mind training. In vocational work we have a direct goal and must not sidestep the issue. It is better to have no problem at all than to work on through one that is vague and misleading.

With these points in mind we are ready to consider the details of a drawing course adapted to fill particular needs. The locality in which the course is to be used may govern this entirely or in part. In beginning instructions in any mechanical drawing there is a vast amount of general information and foundation rules and practices to be acquired. Some course in mechanical drawing should be used that will give practice in handling various instruments. This course should consist first of straight line work beginning with plain blocks and gradually introducing various cuts. The work should bring into use practice in handling some instruments; namely, pencil, eraser, tee square, triangles and drawing board. The proper way of placing the paper on the board and the use of the necessary tools should be carefully handled. From this point advancement is made into circle work introducing the compass. Later a combination of the two kinds of lines may be used. This should lead up to the making of working drawings and simple machine parts which completes one semester of work.

The second semester should introduce orthographic projection work and the theory of it. Inking of drawings should be begun with practice in handling inking instruments in all this work. Developments of some of the simpler kinds may be introduced toward the latter part of the semester.

We might say the two semesters of work should be detailed more clearly. I merely want to offer an outline of work absolutely necessary before a pupil is qualified to take up special related electrical drawing. A great many schools say that ordinary mechanical drawing is satisfactory but a person can be well equipped for reading machine drawings and be absolutely unable to interpret a wiring diagram.

The course in electrical construction is a four-semester course. As one year is taken up with theory, there remains one year, or two semesters, for special related drawing. I, therefore, divide the related electrical course into two parts, each part being one semester in length. The first covers wiring diagrams and the second takes up drawings of electrical apparatus.

The first semester of related drawing, comprising wiring diagrams, takes up a wide range of electrical subjects. The first day or two of the semester should be spent in giving general instructions as to methods and standards to follow in making good wiring drawings. All corners should be square; joints and taps should be indicated by a very small size, black dot, made with a bow instrument and afterwards filled in; caution must be directed against the practice of freehand work on these drawings. It is a strong temptation to make small dots freehand. As it is impossible to make every dot absolutely uniform, unless a bow pencil or pen is used, the drawing may be ruined by this method. Good lettering must be emphasized. As wiring diagrams often carry with them a host of explanatory notes poor lettering may spoil an otherwise good drawing. The lettering should be 3/32" or ⅛" high, never more, and preferably 3/32". The average pupil can best control his hand with this height of letter and make nice, smooth letters. Drawings or diagrams should always be spaced neatly and evenly on the space allowed. Apparatus should be in good proportion, for example, a small ammeter should not be shown larger than a small voltmeter to be used right along side of it. A telegraph key should not be shown a great deal larger than a sounder. A 5 h. p. motor should not be as large as a 100 h. p.

The first plate to be drawn is a sheet of standard electrical symbols. These should be a set, or part of a set, accepted and standardized by the National Contractors' Association and the American Institute of Architects. This gives the boy acquaintance with electrical symbols, used on building plans, and also offers good drill in lettering. This should be followed by some simple circuits which may be made of a set covering series connections, multiple or parallel connections, series-multiple connection, and multiple-series connections. This should be followed by a few bell circuits. These may be given to the pupil complete, or issued in the form of specifications. In using the latter method care must be used that too much

time is not spent in working out the circuits to the sacrifice of drawing time. All through the course great stress must be laid on good freehand sketches. Unless the work is of pretty good proportions, the man on a wiring job frequently works from a pencil sketch. It is necessary that the sketches be very plain so that wires represented do not show up as a confused jumble of lines.

In arranging this course it is well to divide it into a number of distinct sections. Each of the sections should contain a range of problems or projects covering quite fully the particular work. If possible, they should range from a fairly simple circuit in a particular group to a more or less complicated one. Enough problems should be provided so that a boy does not work on the same job as his neighbor; thereby bringing out original thinking on each pupil's part, as well as a cooperative interest in desiring to see what the other pupil is doing.

In laying out work for the course it appears advisable to make a drawing of such proportions as to require only four and one-half hours to each plate. This means one drawing for a week of five periods, each period 45 minutes in length. If a boy must spend more time on a drawing—unless it is of particularly special interest to him—ambition and energy wanes, and the quality of work suffers. To maintain interest, the course should pretty well parallel the electrical course in the shops, offering circuits, however, that do not duplicate those already encountered in the shop. This incidentally gives a boy, learning the new circuits, additional knowledge. If the same circuits were used as in the shop, the boy would soon tell you that he had that in the shop and immediately he loses interest in the job. Interest has been dampened due to the fact that, as he sees it, there is nothing further to learn.

A criticism sometimes advanced is that a course of this nature is simple copy work. A little thought will show this to be untrue. A circuit or group of circuits to go on each sheet is given to the pupil on a space of 3¾"x4½". Given instructions that he make a similar drawing on a space 8"x11½", arranging it neatly, and using the entire available space, it will be seen that it is absurd to make a statement such as the above. There is no scale used on a wiring diagram. Getting good spacing, neat arrangements of wires and apparatus, and relative proportional sizes of equipment causes a boy to call into his memory sizes of the equipment handled in the shop and he then transfers his visualization to paper.

Continuing the definite outlining of a course by groups as begun in the forepart of this article, as good an arrangement as any with respect to both complication and progression would be wheatstone bridge diagrams, simple power distribution system, crane wiring, D. C. motor circuits, transformer connections, high tension transmission systems, A. C. motor connections, converters and battery charging, small power plant connections, simple telephone circuits and radio circuits.

Before leaving a course of this kind a boy should lay out a complete wiring diagram for a house. This is the one drawing in the course where all the equipment is definitely located and necessitates arranging the wires in the best and most efficient manner. They would have to be placed in accordance with the electrical code and run with the smallest practical amount of wire. To cover this in the best manner, give the pupil a complete drawing showing the floor plan of a house or bungalow with all lights, switches and outlets with their relations to each other shown as on a set of drawings used in building a house. This gives the pupil an insight and ability to read any ordinary standard house plan relative to the wiring and electrical installation. This print should be made from a vandyke and the pupil should draw directly on the print. It should first be done in pencil, then checked by the instructor, and finally inked.

In teaching a course in electrical drawing it can be easily seen that a teacher should be fairly well trained in electrical work as well as a good draftsman. Questions will come up to puzzle pupils' minds that should be intelligently answered by the teacher. To sidestep these questions for any reason whatever would cause the teacher to lose his hold on the pupils and destroy a great part of the effectiveness of the work.

In addition to the above it is well to have available several complicated wiring diagrams. If a boy forges ahead in his class and outdistances the rest of his classmates he is ambitious to make a large complicated drawing. For this purpose I use wiring diagrams for electrical railway equipments. This work is fairly complicated, as in an every day necessity a boy electrically interested, is anxious to know how the cars operate. This gives a rare chance to make them appreciate some of the street railway problems. If possible, it is good practice for the boy to make a tracing of this drawing.

The fourth semester's work should differ materially from that outlined for the third semester. In this stage of the work, a boy should be able to read a set of detail motor drawings. He may be called on to care for some motor repairs, requiring a working drawing or sketch of the piece, and he should be equipped to handle this job. It might be said that the drawing or engineering department should handle this part of the work. In some places, yes, because they would be large enough to have an engineering department. In other places the man would have to make his own drawings. There are only about two sources of information for detail work in a drawing room. (I am quoting drawing room practice because it is there the drawing standards are set and developed.) The one is from an actual piece and the other from a design or layout drawing, which is full size if possible.

First let us treat the project by working from the pieces of the actual motor. The job should be apportioned among the class so that all work together as much as possible. Do not assign too many pieces to one drawing as they get complex and the boy gets disgusted and discouraged. Give the assignment to the boy by way of specifications to supplement the actual piece. Suggest the views to be used, give material, number of pieces required, and a name for the piece. Call attention to special notes and screws. The boy then takes the piece and in order to start his drawing must have some figures. This calls for a pencil sketch. He therefore makes a complete sketch freehand, which is inspected carefully by the instructor. Any suggestions and changes should be brought out at this time so that the boy can benefit and avoid the same mistakes on his working drawing. While the boy is proceeding with the drawings it is necessary to thoroughly explain methods of showing conventional screw thread, specifying threads and tapped holes, finding correct tap drills, kind of threads, bolts, screws, etc. Attention must be called to methods of casting. The making of a simple casting should be explained. Tell the boy why rounded corners and fillets are used on castings. Explain limits for holes, running fits, drive fits, and press fits. Show cross hatching representing different materials. Indicate good and bad methods of showing important notes always being careful to show why one is good and the other poor practice. This sounds like a vast amount of information to be given and to be absorbed in a comparatively short space of time. It is, but must be handled first by general class instruction and then again called to each boy's attention as the particular case applies to his work. When he sees it definitely applied to some particular point of his work he associates it with a specific instance and is likely to retain the information. When all this has been incorporated in the drawing and carefully checked over with the boy, ofttimes slight changes greatly improve the drawing. This takes on the aspect then of constructive criticism. The boy sees his weak points and by checking them over with his teacher, fortifies himself against repetition of mistakes. When the pencil drawing is all completed a tracing of the same should be made. This is the boy's first experience with tracing, and since the inking work on it is altogether different from that done on drawing paper, some special attention should be called to it

showing that it is smoother, the instruments therefore sliding easier and the ink drying slower. Blotting must also be dwelt on as it is no easy task to erase on a tracing.

Enough projects should be provided so that no boy in the class duplicates the drawing made by some other boy during the semester. This kind of a course means a great deal of individual instruction. This, however, is a good feature as drawing should be dealt with individually and not collectively. Each boy has a little different method of attacking his work and his own peculiar errors to be adjusted.

The limit of projects for this course is only set by the number of pieces of electrical equipment that a drawing room can obtain. An ideal course offers variety of drawing, a sufficient so that no two boys during the semester would make a drawing of the same piece.

The question of assembly drawings may now come up. The time spent in the making of an assembly drawing in a one-period, one-semester course runs up as most electrical apparatus gets pretty complex due to the small sizes encountered. A boy just beginning tracing and machine working drawing has so much other valuable information to encounter and absorb that real important steps are often lost in work on assemblies.

How will a boy know how to interpret and read an assembly drawing? In the designing departments of industry a designer makes a layout drawing. This drawing is absolutely to scale. If therefore, a drawing such as this were given to a boy with instructions to detail certain parts he gains information from several angles. For instance, he learns the method of engineering procedure. Again, if he can pick out the lines from this drawing and put complete manufacturing information on a detail drawing, he is able to read the assembly drawing and illustrate his ideas in a way that has some commercial value. In making the drawing the same procedures should be followed as previously outlined.

In making up a related electrical drawing course extreme care must be exercised not to make the course cut-and-dried. It should be left open at all points so that new material may be inserted and old material taken out so as to keep the work up to date. A teacher of the subject not electrically trained, as stated before, will not be able to teach a course of this nature. He personally would need to be qualified to make additions to and subtractions from the course. An untrained teacher could not do this. I feel this is a very weighty point and should be a very strong one for, or against, employment of a teacher for this work.

I heard an employer of electricians say that an electrician did not need to know how to read a drawing because he hired foremen to do that. His statement is probably true, but where did his foremen get their information and training in reading a drawing? Some of them learned it on the job, being helped by men who could read them. Some took courses in various schools so as to get the information. Another employer says he wants his men to read drawings as this gives his foremen more time for organization, supervision, and inspection of the work.

Taken from the attitude of the worker, one man says, "I don't have to know how to read a drawing. I know how the work should go in without it." That a statement of this kind is foolish and narrow is obvious. He is not conscious of the fact that his foreman is reading the drawing and interpreting it for him when he tells him where certain apparatus belongs. Were this man able to read the blue prints himself he would likely be a foreman himself, particularly if he is a good mechanic. There are still some foremen around who don't want a man to be able to read a drawing because he is afraid of the man getting his job. The successful foreman of today is often really an executive or at least must have some ability in that direction. If he does have this, the more detail his men can handle, the more successfully will he complete his various jobs.

The electrical workers' union is a good thermometer for conditions of this nature. At a recent survey of its members in Indianapolis, from information turned in to date, the men wanted training in electrical drawing, cost estimating, and electrical engineering. They ranged through all ages. It seems a significant fact that these workers realized they must have more training and are setting high goals. Cost estimating and engineering require ability to read drawings. The extent for which engineering might be given these men would of course depend on conditions, equipment, and time available. They (the majority of them) cannot afford to stop work and go to college to get this work but must get it in connection with their daily work. The drawing and estimating can be given in high school. Some engineering work can also be given and carried on into pretty advanced work if the right kind of teachers are obtained. The two years of related drawing in high school (240 clock hours) really only gives the boy foundation and principles on which to build. If we had four years with a total of 1080 clock hours a boy would be pretty well equipped to both read and make some electrical drawings. The special lines, of course, have to be met with in industry, but if a boy knows just what particular line he will follow and has a resourceful teacher cooperating with him, he may be really well equipped to tackle the job when he receives his high school diploma.

Plan Shop Building. Plans have recently been approved for a $500,000 addition to the Murray Hill Vocational School, New York City. The new building will replace the present two-story buildings on Thirty-eighth Street and will be devoted to shop use. The plans provide space for eighteen shops, with a capacity of twenty pupils to each shop, offering accommodations for a total of 360 pupils. In preparing the plans, a number of special features were approved. Included among these was the suggestion to keep one clear wall space in the sign painting shop for the erection of a movable scaffold for large-scale advertising, poster painting and for a roof playground.

AN INTERESTING TABLE

The accompanying illustration shows a hand carved table made by Harold Feenye, a ninth grade student in the West Intermediate School of Davenport, Iowa. It is a free copy of an Italian Renaissance design and was entirely made and carved by the boy. The picture was taken before the mahogany was stained and varnished. The work was done in the class of M. A. Mosher, director of industrial arts in the West Intermediate School.

INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN
Editors

INDUSTRIAL ARTS FOR APPRECIATION

So much attention has been given in the last few years to trade training and to specifically vocational work that some young teachers and others are liable to get the impression that there are no values except trade and vocational values in any of the educational shop-work.

It is worth while, therefore, to recall the fact that some of the greatest values of shop work have very little vocational significance. The entire field of industrial arts as such work as found in the elementary and high schools, especially the junior high schools, has but incidental vocational significance, and that particularly of a guidance nature.

The shopwork of the elementary and junior high schools, like history and algebra, is for general educational purposes and is for everybody, regardless of his future occupation. There are certain contacts which each boy must sooner or later make with the material world about him. There are certain obligations, aside from his business or trade relations, which a boy must sometime assume.

Every good citizen must sometime think in terms of houses, homes, furniture, pictures, electrical conveniences, and a thousand and one other things that have no immediate and technical relation to his bread-and-butter job. Every good citizen must sooner or later think in terms of proportions, tones, colors, decorative treatments, structural fitness and relations, etc.

Furthermore, every man, of whatever occupation, must come into some sort of relation to the duties, occupations, and fields of labor of other men.

It is to this general task of preparing young people for such contacts, thoughts, and relations to the citizen-life that the subject of the industrial arts definitely sets itself. *It is the problem of the development of appreciation through shop, classroom, and studio contacts and experiences.* It is an element without which both education and life will always be both incomplete and ineffective.

THE TIME ELEMENT IN TRADE TRAINING

The necessity for a reconsideration of the time element in learning a trade is becoming increasingly apparent. Indeed the whole question of the time necessary to get an education or training of any sort is receiving more and more attention. It has recently been shown that the modern high school curriculum is fully the equivalent in many respects of the college curriculum of a half century ago. And yet, it still takes four years to graduate from college. The character and amount of the material of the curriculum have radically changed in the meantime, however.

There is still insistence on the traditional time of learning a trade, although the organization of the subject matter and the elimination of non-essential duties and routine have greatly added to the efficiency of the instruction given the young tradesman.

Notable progress is being made, however, in proper trade training in trade schools. Satisfactory arrangements are now being made with employers and labor unions looking to the recognition of trade school work on a unit operation basis. Thus, the operations which the student workman would have to perform in industry might conceivably be mastered in the trade school in a much shorter time than if he were an apprentice in the industry.

Labor is rightfully interested in keeping industry from being filled with partially prepared workmen. It is likewise interested in keeping more men from learning trades than can be absorbed in industry. When the skilled workman can be safeguarded against an influx of partially trained men and an abnormal increase of workmen in his trade, the time element in trade training will cease to be so important and in some trades it will be materially reduced.

A STORY FOR INDUSTRIAL-ARTS TEACHERS

In a recent book on the teaching of mathematics,[1] Mr. Harry C. Barber tells the story of three men who undertook to teach three boys how to use a hammer. The story needs no explanation. For the industrial-arts and the vocational teacher it is confirmation and an expression of principles and methods which academic men are slowly beginning to appreciate. The story:

"Once upon a time three men undertook to teach three boys how to use a hammer. The first man was an old-time teacher. He wrote his lessons as follows. 'A hammer is an instrument for driving nails, or beating metals, or other objects. A hammer has two parts, a handle and a head. The head is made of metal; the handle is made of wood. Hammers are of ten kinds: the tack hammer, the carpenter's hammer, the ball peen hammer, etc. A tack hammer is used for driving tacks, etc.' Then he called the boy, who set diligently to work learning about the hammer.

"The second man was a carpenter. He gave the boy a hammer and told him to go to work.

"The third man was a friend of boys. He discovered that his pupil wanted to build a boat. A hammer was among the things needed. When all was ready, they set to work. At first the boy was awkward with the hammer, so the man asked him a question or two about how best to use it. A nail must be pulled. The man pulled it himself, while he talked a little about the lever. Soon the boy wanted to know if the hammer could be used for this or that purpose. The man showed him patiently. A nail must be driven where

[1] Teaching Junior High School Mathematics. Houghton Mifflin Co., Boston.

the boy could not reach with his left hand to hold it. His teacher fitted the nail into the claw of the hammer and reaching up with one hand set the nail.

"At the end of the lessons the examiner came. When the first boy was summoned, he repeated glibly all the definitions of hammers, and the rules for using hammers, while his teacher smiled his approval. The examiner, pointing to a broken table said, 'Fix that.' The boy looked at the table, shook his head, and replied, 'I did not study that.'

"When the second boy came, the thumb and finger of his left hand were wrapped in bandages. In answer to the questions about the hammer, he had little to say beyond pointing to a hammer and saying, 'That is one.' 'Fix the table,' said the examiner. The boy tried to do so, but his blows fell so awkwardly that the table was soon in worse condition than before.

"The third boy came. The first question was, as before, 'What is a hammer?' 'A hammer is what you use to drive nails. And you can pull nails with it too. And you can set nails in places that are hard to reach.' Before he was through telling all that could be done with a hammer, the examiner smiled and said, 'Fix the table.' The boy did so."

FOOTBALL AND THE COST OF EDUCATION

It is interesting to see how easily money comes, if it is extracted by the painless method. It excites no particular comment for a football game in a large university to net a hundred thousand dollars. This would probably exceed the total annual appropriation for any college on the campus of such university. Instances could be cited where the receipts from state university football seasons exceeded the total state appropriation for the teachers' colleges of those states.

And now comes the Missouri State University with its post season game in California for a gift of $75,000. This splendid gift will be used to good purpose in helping to build a new stadium for more football games. Such a gift far exceeds the Missouri Legislature's wildest dream of extravagance.

This is not a complaint that football costs too much or that it should not be indulged in. We are simply marvelling at the ease with which huge sums of money can be raised for such sports and the excruciating agony with which tax payers part with their money for necessary school purposes. We hazard the guess that the money expended on football during the season just closed would be sufficient to provide adequate educational facilities for all the multitudes of children in this country who are now helplessly and hopelessly denied educational advantages.

Let us remark again that we are not complaining. We are simply remarking that when it comes to spending money the American people, like the "Heathen Chinee," are "most peculiar."

MORE THAN SLIGHTLY MISTAKEN

We heard a rumor; nothing more than a casual rumor passed on by one enthusiast of Art Education to another; to the effect that millions left by a philanthropist were to be devoted to Art Education in the United States. "You are slightly mistaken," said the Librarian when the rumor was repeated to him. "I happen to know that it is Adult Education in place of Art Education that is to be promoted by the million dollar process."

Not being informed on the million dollar process of education as applied to adults and having visions of what might be done with a few millions applied to Art Education, we decided that the donor of millions and we were more than slightly mistaken.

Ah well! Imagine a collection of fine works of art, well placed and well presented in connection with the libraries of each town of the United States. Imagine what a few millions might do in the way of making our school buildings attractive and instructive with pictures, sculpture, and examples of good industrial design. Imagine the inspiration of a course of illustrated talks by our best disciples of beauty barnstorming the country during the winter months. Imagine extension classes conducted from the colleges by capable teachers of the fine arts.

"Adult Education." As before said we are not informed, but we have abiding faith in that proverb of the bent twig.

THE GROWTH OF VOCATIONAL EDUCATION IN 1923-24

The annual report of the Federal Board for Vocational Education for the year 1923-24 indicates a very healthy growth in the various types of vocational schools promoted and aided by Smith-Hughes funds. According to the board, sufficient evidence exists to demonstrate that the program of federal participation has been worked out with reasonable success, and that the state programs are being promoted.

The funds which the local states are providing to match the federal aid is growing steadily and has advanced from $2.17, which was the minimum figure in the year 1919, to a present expenditure of $3.33 for each dollar of federal money in the year 1924. During the year ending June 30, 1924, the federal government appropriated a total of $5,190,448, of which 93 per cent, or $4,831,880, was expended on requests of the 48 states participating in the funds. Including these federal expenditures, the total outlay of the states was $16,551,548.

The enrollment in various types of schools has been growing even more rapidly than the expenditures. During 1923-24 a total of 652,994 pupils of all grades were reached in the federally aided schools. This is an increase of more than 116,446 pupils during the year.

During the past year the federal board expended $1,240,500 for civilian rehabilitation and carried on a wide program of research and service in the general promotion of vocational education in all types of schools.

EASTERN ARTS ASSOCIATION CONVENTION

The Sixteenth Annual Meeting of the Eastern Arts Association will be held April 23, 24, and 25, at Springfield, Mass. Inquiries concerning speakers or subjects to be discussed may be directed to Mr. G. F. Hatch, chairman of the program committee, department of manual arts, 15 Beacon Street, Boston, Mass. Similarly, inquiries about commercial and school exhibits at the convention may be sent to Mr. C. E. Newell, administration building, Springfield, Mass.

"A Trip With Mr. Brown"

Howard G. Olivit, Instructor in Trade Pattern Making,
East Technical High School, Cleveland, Ohio

FOREWORD

We are being constantly reminded of late by public speakers and by good teachers, of our utter helplessness as individuals. We are frequently being urged to substitute internationalism for nationalism. We are constantly being implored to consider our neighbor in a more friendly way, and the brotherhood of man will sometime be a reality rather than a dream.

Cooperation in our economic life, if properly inspired and practiced, will be a strong help in the solution of many problems of capital and labor. We are prone to consider *our* work as most important, and to consider lightly the importance of the other fellow's work in the general scheme of things. This is true in all branches of labor, and our duty as teachers and as good citizens is to combat that feeling and work toward a closer unison of mankind.

It was with this thought in mind that this playlet was written. It has been given twice at East Technical High School, once as an auditorium exercise, and later as a feature of commencement exercises. It has been exceedingly helpful in cementing the different branches of technical work into closer harmony.

It so happened that there was under construction at East Technical, at that time, a small drill press, but most any machine could be substituted in its place. You will note that the name, Blank Technical High School, has been used in place of any other.

Scene 1
Modern Office

Characters: Two boys, one impersonating Mr. Brown, a business man, who has conceived the idea of constructing a Bench Drill Press and is having it built in a modern manufacturing plant: the other boy taking the part of a stenographer, working at the typewriter.

Enter Mr. Brown smiling profusely.. (Nods.)

Stenog. "Good morning Mr. Brown, you're all smiles this morning,—you really seem happy."

Mr. Brown. "Yes. I've just come from the printers and I am delighted. We're going to have the nicest little catalog for our drill press that you ever saw; it will show every operation in the construction of the drill press right from start to finish. Are you familiar with the different operations necessary in the construction of a piece of machinery?"

Stenog. "No, I don't think I am."

Mr. Brown: "Well it's really a most interesting process of development and I have always believed that if our high school students were familiar with the full course of operations in the production of machinery, more of them would specialize in technical subjects while in school. Would you like to take a trip through the various shops, and see the development of the drill press?"

Stenog. "I certainly should."

Mr. Brown. "Well I have arranged to take a fine group of high school students on a trip through the different departments so that they may see the evolution of our drill press after it leaves the designer, and we'll go through the drawing room and the pattern shop, and then to the foundry and machine shop, and I'll be mighty glad to have you go along."

Stenog. "Fine, I'll go."

Mr. Brown. "All right, let's get started."

Curtain.

Scene 2
Drawing Room

Characters: Four boys, chief draftsman in charge, two working at drawing tables, one at office desk looking over blue prints.

Chief. "Having any trouble with the details of the drill press, John?"

John. "No Mr. Wilson, they're not so hard. The shop mechanics I took at school helped me out of the difficult problems."

Chief. "I'd like to have the index started, have you had any experience in that line?"

John. "Oh yes, Blank Technical High School gives a very good foundation on indexing; there, all specializers must at least make a complete set of details with an assembly properly indexed."

Chief. "Fine, I won't have to instruct you very much in that line. It won't take long, there are only about 43 detailed parts to the drill press. The pattern shop is calling for more blue prints and I'd like to hustle this job through."

John. "I'll have a couple of these ready shortly, but I doubt whether we'll be all through today."

Enter, boy from pattern shop.

Boy. "The boss of the pattern shop would like to know if you have any more blue prints of the drill press ready?"

Chief. "Yes, one or two, and we're on the last of the details now; they will be ready in a short time; the layout is completed and everything is checked, so there won't be anything to delay us now."

Call blue print boy. "Make a couple of blue prints of these tracings."

John. "The tracing of the base is about done, and as soon as I'm finished with it, the rest of them will go much faster as they are smaller."

Chief (to pattern shop boy): "We'll see that you are kept busy. Tell your foreman I'll soon have the other drawings ready and sent down to him." (Hands him blue prints just made.)

Pattern shop boy. "All right Mr. Wilson, thanks, I'll tell him."

Chief. "Frank, you'd better make the assembly next."

Frank. "All right. I'll finish this and figure up the details to determine what size paper to use."

Enter, Mr. Brown. "Hello Wilson, I thought I'd stop in and see how you were getting along with the drill press drawings."

Chief. "The details are nearly all completed and this man will start on the assembly in an hour or so."

Mr. Brown (looking over drawings). "Say, these drawings look fine; you must have some good draftsmen working for you."

Chief. "Yes; these fellows are graduates of Blank Technical High School, and they've only been here a short time. I always call Blank School whenever I need new boys, as I find that most of their specializers are highly recommended, especially after they've been at work for a short while."

Mr. Brown. "That sounds good. Keep after it Wilson, I must be moving along, I'm going over to the pattern shop to see how they are progressing. So long."

Chief. "Good day Mr. Brown."

Curtain.

Scene 3
Pattern Shop

Characters: Three boys, owner, at bench checking up patterns, pattern maker, working at bench, on drill press pattern, and applicant for job.

Pattern maker (to owner, Wm. Hawley). "How long have you been running this shop, Bill?"

Hawley. "Three years now. After I was graduated from the specializing course in pattern making at Blank School, I worked around for a while and got a little experience, and then started this shop."

Enter boy, looking for a job. "Good morning. May I speak to the owner of this shop?"

Pattern Maker. "There he is." (Pointing to Hawley.)

Boy. "Good morning, I'm looking for a job. Do you need an apprentice?"

Hawley (looking him over). "Yes, I could use one. Have you had any experience?"

Boy. "Yes, I specialized in pattern making for two years at Blank Technical High School."

Hawley. "What does that mean, what did you learn there that makes you think you can work at pattern making?"

Boy. "We learned something of tool manipulation, which includes the care and proper handling of chisels, gouges, planes, and so on."

Hawley. "Have you had any blue print reading?"

Boy. "Yes, we had blue print reading. This involves the proper arrangement of views showing the outline of the object; the location and construction of the various parts; and the accurate dimensions properly placed."

[1]Copyright 1925 by Howard G. Olivit.

Hawley. "That's good, have you had anything else?"

Boy. "Yes. We had pattern shop mathematics, that is, all of the elementary processes that may be involved in typical shop problems, such as the use of geometrical formula and the figuring of weights of castings, besides the keeping of time and material records, also pattern storage records and so on."

Hawley. "Then you ought to have a pretty fair training and be able to make yourself useful immediately; you can start in the morning."

Boy. "How much will you pay me?"

Hawley. "I'll start you in at 35c an hour, and give you more if you deserve it, but bear in mind that men are rewarded, not alone for accomplishment, but on the basis of service as well."

Boy. "All right, thank you, I'll be in in the morning."

Hawley to Patt. Mkr. "I believe that boy will make good."

Patt. Mkr. "Yes, I think so, too: if he went to Blank Technical he's had the opportunity to learn how to make good anyway, then it's up to him."

Hawley. "Say Tom, how long will it be before you finish those drill press patterns?"

Patt. Mkr. "Oh, they'll be done in a day or so."

Hawley. "All right, let's hurry them through, I'm expecting Mr. Brown in some time today."

Enter Mr. Brown. "Good morning Mr. Hawley."

Hawley. "Good morning Mr. Brown."

Mr. Brown. "How are the patterns for the drill press coming along?"

Hawley. "Just fine Mr. Brown: some of them have already been sent to the foundry, and have been cast, and the others will be finished in a day or so."

Mr. Brown. "All right, send them right over to the foundry as soon as they are completed; I'm going over to the foundry now, good morning."

Hawley. "Good morning Mr. Brown."

Curtain.

Scene 4

Foundry

Characters: Three boys, one, the foreman, the other two, molders. (One silent and busy.)

Foreman. "Well I'm going to quit Saturday, Dick.

Molder. "Quit?" (Slowly and in surprise.)

Foreman. "Sure. Quit."

Molder. "Why, how's that; you don't often hear of a foreman quitting his job; gee, if I could be foreman I'd never quit."

Foreman. "Maybe you didn't have the opportunities that I had Dick. You're fifteen years older than I am and when I went to high school I had a chance to specialize in some subject that I liked, so I chose foundry. I spent two years in the foundry at Blank High School and acquired a good general knowledge of foundry practice before I actually started to work at the trade, and in two years I was promoted to a foremanship in this foundry, now I have accepted the position as superintendent at the John Black Co., and I am to start in the first of the month."

Molder. "Well say Jack, can't you give me a job as foreman in the foundry where you are going?"

Foreman (slowly). "Highly sorry Dick, but I'm afraid we'll have to get some one with more education."

Molder (in surprise). "Education? Why it don't take education to pound sand, does it?"

Foreman. "No, not to pound sand Dick, we have molding machines to do that; but you see you have no training in mathematics, or in the chemistry of metals, or in the handling of men, nor anything BUT pounding sand. (Here he should have a casting in his hands and be knocking off the gates.) You're just like a machine. Well I must send these castings over to the machine shop."

Enter, Mr. Brown. "Hello men. What's the good word, any castings?"

Foreman (presenting a casting). "There they are."

Mr. Brown. "Say these are FINE castings. No sand holes or blow holes, good gray iron, and very clean. How many sets have you sent to the machinist?"

Foreman. "Three."

Mr. Brown. "Fine. I must get over there and see what progress they are making. Try and hustle the rest of the castings along. Good bye."

Foreman. "Good bye, Mr. Brown."

Curtain.

Scene 5

Machine Shop

Characters: Two boys, both at work, one at bench on a piece of the drill press, the other at work on a completed drill press, testing, examining and so on.

First boy. "Say Ed, when do we move into the new building?"

Second boy. "Two weeks from Thursday; BOY, that's going to be SOME shop. All new and up-to-date machines and tools, and every machine with individual motor drive, SOME class I'd say."

First boy. "Well it beats me; Joe certainly has had good luck; to think of the start he had, and then to move into his new building, and all in so short a time. HOW DOES HE DO IT?"

Second boy. "Oh well—you know it isn't all his. You see he and Jim are in partnership, and they have built up a splendid business, simply as a result of square dealing and 'knowing how'."

First boy. "But didn't they have two years of actual machine shop training and practice at Blank Technical before they started in, so that they had a good foundation, and not only knew machine shop work themselves, but knew how to pick the right man for the right job?"

Second boy. "Yes. You know the machine shop course at Blank School teaches all of the fundamentals of machine shop practice, such as calculating speeds and feeds, tapers and taper turning, screw threads, indexing and spiral cutting and some gear work; besides experience in operating all standard machine tools, bench work, assembling and erecting together with one period a day in machine shop mathematics, and if a graduate does not have a pretty fair knowledge of machine shop practice when he gets through, it's his own fault."

First boy. "Good afternoon Mr. Brown, how are you today; anything new?"

Mr. Brown (looking around in exultation while examining drill presses). "ANYTHING NEW. Well it rather looks as though there was something new. These drill presses are about the newest thing I know of, and to me they show about the best example of cooperation in the successive division of labor that I have ever seen."

First boy. "Weren't you acquainted with the scheme of development of the drill press?"

Enter Mr. Brown.

Mr. Brown. "Yes I was, but I had no idea that high school students actually had the opportunity to engage in these things, and I realize now as never before, the education that may be derived from specializing in a technical subject while in high school, especially if a student finds it impossible or unwise to go to college; and it shows, too, the necessity for close cooperation between the drawing room, pattern shop, foundry and machine shop, in order to obtain results in building machinery."

First boy. "Well, Mr. Brown, if these things have been made somewhat clearer, we are glad, and our little sketch has not been in vain."

Curtain.

SUGGESTIONS ON STAGING

Knowing that the proper staging of a play is very important, a few words regarding this may not be amiss. It is unnecessary to have too elaborate a setting. Our stage was large enough to afford the placing of scenery so as to make a room about twelve feet deep by about twenty feet long. There was a door in the twenty-foot side of the room, in about the center, and a few feet from this door and to the right was a window. In the right-hand wing was another door. This room with the necessary changes made before each act served for all five scenes.

Five signs were made by the sign painting class, with letters six inches high, with the words, "OFFICE"—"DRAWING ROOM" — "PATTERN SHOP" — "FOUNDRY"—and "MACHINE SHOP," which were used in their order as needed.

For the first act, things were arranged as nearly as possible to represent a modern office. On the wall was a calendar, a map, and a picture or two; a flat top desk and a desk chair were placed near the window, and a stenographer's table with a typewriter properly placed stood at the left of the room. Mr. Brown entered through the door in the right wing. The two doors served to relieve the monotony of travel in one direction during the entire play. Boys were dressed in their ordinary street clothes.

Scene 2—Drawing Room. For the second act, the sign over the door was changed to "Drawing Room."

Wall decorations were replaced somewhat with large blue prints. The desk remained in its place and was covered with blue prints. A boy sat at the desk examining blue prints, which gave a sort of business-like appearance; this boy took no oral part in the play, but was seen in all the acts.

Two large drawing boards placed on horses finished the setting for this act. One or two large castings or pieces of machinery, such as parts of a shaper or planer, or a gas engine, placed somewhere on the floor, would help the drawing room appearance. Draftsmen were in their shirt sleeves.

Scene 3—Pattern Shop. Sign was changed to "Pattern Shop." Walls remained much the same as in the drawing room scene. Two pattern makers' benches with the necessary tools in place were used. One boy was working at the bench with the drill press column in the vise. The boss was checking up patterns at the other bench, which was covered with patterns. There were two horses with a few boards of pattern lumber placed on them, with a saw leaning against one of the horses. Numerous patterns were placed about the room. Drill press patterns were much in evidence. Boys were in their shirt sleeves and wore shop aprons.

Scene 4—Foundry. Sign was changed to "Foundry." While a desk is seldom seen in an open foundry, but is usually placed in the foundry office, we allowed it to remain as it had been in the other scenes.

A molding bench from the pattern shop was used; this was furnished with a high back with a shelf on top, such as is typical of an up-to-date foundry, and on this was placed rammers, slicks, etc., not actually in use by the molder, who was ramming up a mold during the act. Three or four open molds of the drill press reposed on the floor, tilted somewhat so they could be seen by the audience.

The other molder was at work on the mold for the column; the boss stood near, calipering a core for the column, while the molder drew the column pattern from the mold. Two or three castings with gates still intact were on the floor. Boys wore overalls.

Scene 5—Machine Shop. Sign was changed to "Machine Shop." The desk remained as before. Wall decorations were changed a little and a large cross section of a lathe was exhibited. A short but heavy machinist's bench and vise was at the left of the room; a boy was at work at this bench. In about the center of the room was a table eight or ten feet long; mounted on this table was a motor, and two nearly completed drill presses were conveniently placed.

During the conversation the boy at the long table is slowly completing the assembly of one drill press, wiping it off with cotton waste and thoroughly examining it, after which he puts on the belt from the motor to the drill press, throws the switch, and watches the delighted expression on the face of Mr. Brown, and in fact all concerned.

Boys wore overalls and no effort was made to hide dirt or grease. The more nearly each act portrays the exact dress and manners of expert mechanics in the different branches of the work, the more successful the play will be.

Dynamic Symmetry in Nature

R. Kimball, Beverly, Mass.

As dynamic symmetry is based on natural growth it is very interesting to analyze plant forms to see what rectangles are found and how they are cut or combined. In using flowers for this purpose, the larger and simpler shaped single blossoms are much easier to work with than either small or double specimens.

The first thing necessary is an accurate drawing of the specimen, usually a side and top view. These should be selected like the views in an orthographic projection drawing and made carefully and accurately. Then rectangles are drawn to exactly enclose these drawings. The simplest way to analyze these rectangles is by means of their arithmetical ratios, measuring them in centimeters, then proceeding graphically for the details.

To illustrate this, let us take a lily and a cardinal climber flower. The lily rectangle is 10.26 ± cm. × 9.18 ± cm., giving a ratio of 1.118 or one-half of a root five rectangle (2.236÷2=1.118). The rectangle enclosing the main cup of the flower measures 9.18 ± cm. × 5.68 ± cm., ratio 1.618, a whirling square rectangle. The distance from the base of the flower at the stem to this rectangle is 2.50 ± cm., giving a ratio for this portion of 3.618 or three squares and a whirling square reciprocal. The drawing shows some very interesting details of this application. Note how the reciprocal of the large whirling square rectangle relates to the tube at the base of the flower and how this tube grows in relation to the whirling square rectangle in the base. The other drawing gives a more detailed analysis of the flower. The 1.118 rectangle is divided into two root-five rectangles and the analysis carried out by applying whirling square rectangles at the ends of these.

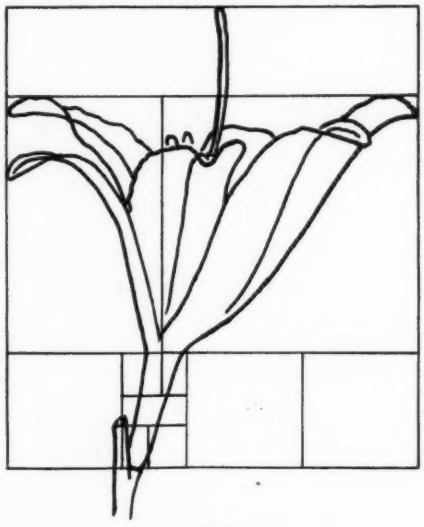


FIG. 1. LILY.

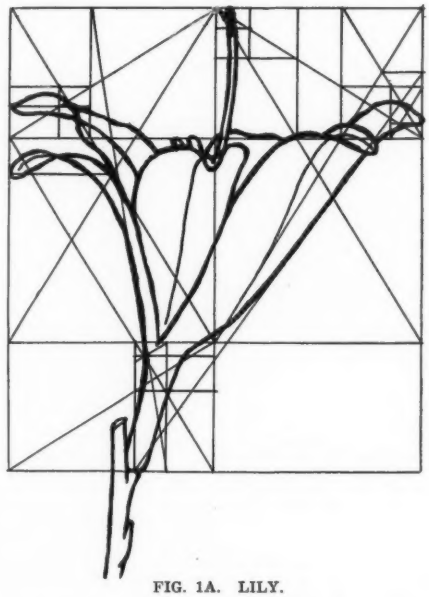


FIG. 1A. LILY.

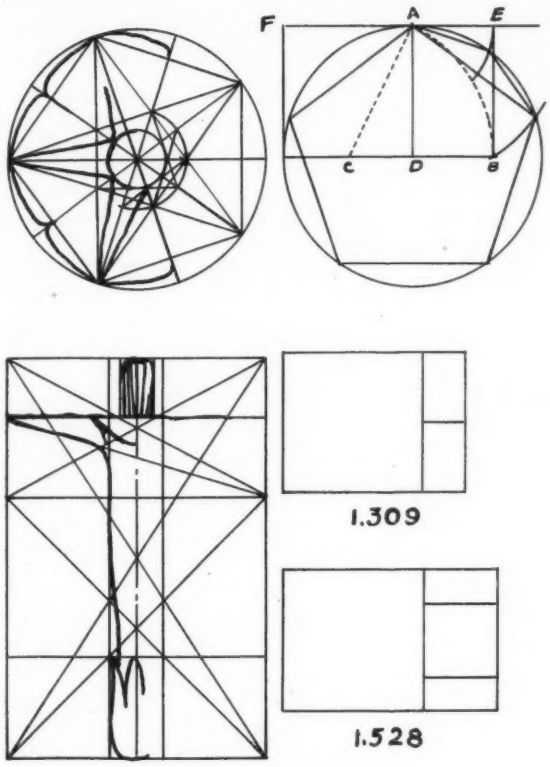


FIG. 2. CARDINAL CLIMBER.

The cardinal climber flower has been worked out at two times its natural size. The drawing of the flower was, of course, made actual size and then enlarged by using dividers on all measurements. The enclosing rectangle in this case has a ratio of 1.528 which shows it to be composed of two squares and two root-five rectangles arranged as shown in the diagram. The flower minus the stamens is contained in a 1.309 rectangle. The decimal .309 is half of .618 and the square and two whirling square rectangles are arranged as shown. In the side view of the flower, the 1.528 rectangle has a square and 1.309 shape laid out from one end. The intersection of the diagonals of the 1.528 rectangle with those of the square gives the width of the flower tube and calyx. These lines cross the diagonals of the square at the length of the calyx, and the diagonal of the .309 rectangle coincides with the slant of the petals. The top view of this flower, based on a regular pentagon brings up some interesting facts.

Reference to the diagram of a pentagon in a circle will show that it is drawn by a method often used by draftsmen, in which point C is in the center of a radius and point B on the diameter is found by using the radius CA with C as a center. This construction, if we consider the whole of square DF, gives a whirling square rectangle FB (drawn by using the diagonal of half a square), and its reciprocal AB is also a whirling square rectangle. In the terms of dynamic symmetry, if the length of a whirling square rectangle is used as the radius of a circle, the diagonal of the rectangle will divide the circumference into five equal parts, and the width of the rectangle will divide the circumference into ten equal parts.

The central tube of the flower (top view) is a circle tangent to lines connecting every fourth point of a decagon whose size is determined by the diagonals of the large pentagon.

It is almost uncanny the way these rectangles coincide with natural forms. The flower shapes are always drawn first and never modified in any way during the analysis. The top view of the lily was not included, as it is rather complicated. It is enclosed in a 1.1309 rectangle, which is a square plus a strip equal to one-tenth of a 1.309 rectangle. One of the large shapes in this view is a 1.528, another is a 1.3416 composed of three root-five reciprocals side by side ($3\times.4472=1.3416$), another is a 1.809, a square plus half a whirling square rectangle ($1.618\div2=.809$), etc. These simple combinations occur again and again in natural and many Greek objects are shown to have been based on them.

Inspecting a Split-Phase Induction Motor (Single Phase)

Geo. A. Willoughby, Arthur Hill Trade School, Saginaw, Mich.

Operations Necessary to Perform the Job

1. Remove the head screws.
2. Remove the rear head, or pulley end head, and rotor.
3. Place the screws in a box so they will not be mislaid or put them back into the body of the frame.
4. Put the head and rotor on a rack or in a position where it will not fall or be injured in any way.
5. Note carefully the construction of the rotor.
6. Note carefully the windings on the stator.
7. Note how the ends of the windings are attached to the binding posts.
8. Inspect carefully the general arrangement of parts and answer all the questions at the end of this lesson.
9. Put the motor back together again.

Materials Required. Single phase motor of the split phase type; paper and pencil.

Tools Required. Screw driver (perhaps others as required).

Description of Operations. Small motors for use on alternating current circuits are found extensively on washing machines, ironing machines, and for general power purposes. A common type is the Robbins & Myers, illustrated in Fig. 1 and (its parts) Fig. 2.

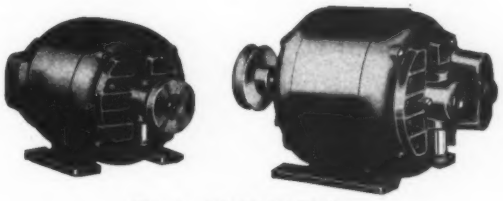


FIG. 1. SMALL MOTORS.

Dismantling the Motor. In small motors of this kind it is common to find the head opposite the pulley end cast integral with the frame. The head at the pulley end is attached to the frame with head screws (70 in Fig. 2) which can be readily removed with a screw driver. With these removed, the head together with the rotor can be taken out, leaving the windings on the stator exposed. For a simple inspection of the motor no additional dismantling is required. If more extensive checking or repair is required, extreme care should be exercised when removing other parts as well as when reassembling them.

Characteristics of the Rotor. The rotor, or revolving part (56 in Fig. 2), has no visible winding on it and there is no electrical connection to it in a way. However, there are copper bars laid in slots and connected at

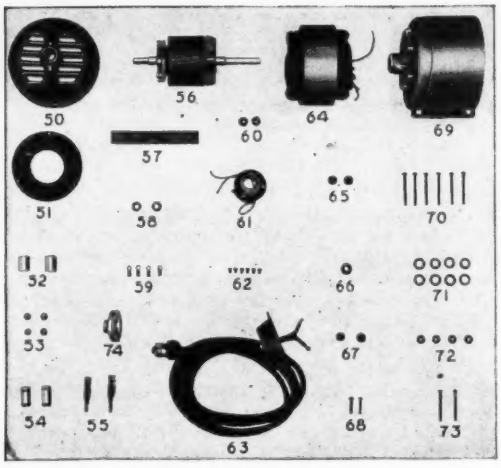


FIG. 2. PARTS OF SMALL MOTOR.

the ends. Any metal cylinder would revolve if substituted for the rotor, but the construction of laminated iron with the copper bars provides the most satisfactory and efficient arrangement. The laminated iron carries magnetism readily without heating. The fact that this rotor, without electrical connection to the winding or without having current forced through it revolves because of induction caused by the current in the windings on the stator, gives the motor the name of "induction" motor.

Characteristics of the Stator. The frame of the motor will be found to be of cast iron, but the wound stator (64 in Fig. 2) is made of laminated soft steel because it must carry the magnetism caused by the current through the windings. Cast iron would not do this well, and it would probably get hot, due to currents flowing in it.

Winding on the Stator. The winding on the stator will be found to consist of two main parts, one a running winding of comparatively heavy wire and one a starting winding of rather fine wire. The ends of these windings will be found to be brought out and connected to the binding posts to which the cord wires are connected. However, in the starting winding circuit will be found some type of automatic switch which will open the circuit when the motor attains a certain running speed.

The flow of alternating current through the running winding alone will cause the rotor to revolve after it has attained a certain speed, but the additional starting winding of fine wire is necessary to make the rotor come up to speed. It is from these two windings that the motor gets the name "split phase." The fine wire winding "splits" the current as it flows into both windings and the result of the two windings and different currents in them causes the rotor to come up to speed. At this time the automatic switch opens the starting winding circuit and the motor runs on the running winding alone.

Note how these windings are put on. The running winding will be found to form groups of windings or poles, and the starting coils will be found to be between these pole windings. The number of pairs of these pole windings determines the speed of the motor on any given kind of circuit. The greater the number of pairs of poles, the less will be the speed.

Note any other points of interest relative to the construction and arrangement of the parts of the motor and after having checked up on all the questions, assemble the motor and leave it in the same condition as it was found.

Questions:

1. What are some of the common uses of small motors on alternating current circuits?
2. How is the head of a motor of this type removed?
3. Of what does the rotor consist?
4. Where does the motor get the name "induction"?
5. Of what does the stator consist?
6. Why is this not made of cast iron?
7. How many separate windings are there on the stator?
8. How do the size of wire and the number of turns of the windings compare?
9. Where does the motor get the name "split phase"?
10. What is the purpose of the winding of fine wire?
11. How many poles are there in the running winding?
12. How many are there in the starting winding?
13. What is the purpose of the automatic switch?
14. How does the number of pairs of poles in the winding compare with the speed of the rotor?

TYPE JUSTIFICATION

Together With a Brief Outline of the Relative Widths of Spaces and Quads Based on an Imaginary Unit System of Measurement Giving an Em-Quad 60 Units

Frank P. Rich, Tyler Street School, Boston, Mass.

One requirement of good printing is that the spaces between words shall appear equal. When setting type a 3-em space is usually placed after each word before starting the next word of the copy. Having reached the end of the line, and not having enough space between the last 3-em space and the side of the stick for the next word of the copy, it becomes necessary to change the spacing pieces to make the line fit the measure of the composing stick. This problem of correct spacing between words in a line is called justification.

Since most lines of type require respacing, or justifying, it is very necessary to know how to do this accurately and rapidly. The first step in acquiring this knowledge and skill is to know the relative sizes of the different spacing pieces in a font of type with which this respacing must be done.

Spacing Pieces

There are two classes of spacing pieces; namely, spaces and quads. All spacing pieces are fractions or multiples of the em-quad. The em-quad is a square spacing piece of the type with which it is used. There are 6-point ems, 8-point ems, 10-point ems, etc. Other quads are the 2-em quad and the 3-em quad, which are two and three times as wide as an em-quad.

The spaces also vary in size, and each different size is known by the fractional part of an em its face is wide. In the ordinary font of type, four different sizes of spaces are used. The names of these spaces, beginning with the thinnest, are 5-em, 4-em, and 2-em or en. The 5-em space is so-called because it takes five of them combined to equal the width of an em-quad. Similiarly it takes four 4-em spaces to make an em, three 3-em spaces to make an em, and two 2-em spaces or en quads to make an em. The terms 5-em, 4-em, 3-em, and 2-em are abbreviations of 5-to-the-em, 4-to-the-em, 3-to-the-em, and 2-to-the-em.

Teaching the Relative Widths of Spaces and Quads of Any Point

The *least common multiple* of the numbers 5, 4, 3, and 2, is 60. For teaching purposes, let us imagine that an em-quad of any size type is divided across its face into 60 slices, and call each slice a unit. Since five 5-em spaces equal in width one em-quad, then, considering an em-quad as having 60 units in its width, a 5-em space has 1/5 of 60 units, or is 12 units wide. A 4-em space is 15 units wide; a 3-em space is 20 units wide, and a 2-em space is 30 units wide.

Knowing the relative widths of the different spacing pieces, it can readily be seen that if it is necessary to justify a line of type to the measure of the composing stick by respacing it, replacing the 3-em spaces with wider spaces, the next wider space is the 24-unit space, made by using two 5-em spaces. The next combination is the 27-unit space, made by using a 5-em and 4-em space. Next in order comes the 30-unit space, made with the 2-em space or en quad, and so on. The following table illustrates a few of the many combinations possible, together with their respective widths in units:

Spaces	Fractions of an Em
Five-em	12-60
Four-em	15-60
Three-em	20-60
*2 five-em	24-60
*Five-em and four-em	27-60
En-quad	30-60
*Five-em and three-em	32-60
Four-em and three-em	35-60
*3 five-em	36-60
2 three-em	40-60
*Five-em and en-quad	42-60
Four-em and en-quad	45-60
Three-em and en-quad	50-60
*2 five-em and en-quad	54-60
*Five-em, four-em, en-quad	57-60
Em-quad	60-60

*In most printing plants the element of time is the greatest factor to be considered, and the correctness of the spacing is secondary. With this fact in mind, and in order that time may be saved in justifying lines of type when 3-to-em spaces do not fill the measure of the composing stick, the starred (*) spacing combinations are quite often omitted and the next spacing combination in order is used.

Example. When the use of 3-to-em spaces (20 units) placed between words in a line do not fill the measure of the composing stick, they may be replaced with en-quads (30 units) in as many places as possible instead of using 2 five-em spaces (24 units) or the five-em and four-em space combination (27 units) to make the line tight.

If en-quads (30 units) have been placed between all the words and the line is still loose, the five-em space and three-em space combination (32 units) is omitted and the en-quads are replaced with the 3-to-em space and 4-to-em space combination (35 units) in as many places as is necessary to make the line tight.

Proceeding further, should the 3-to-em space and 4-to-em space combination (35 units) not fill the measure of the composing stick, the 3 five-to-em space combination (36 units) is omitted and two 3-to-em (40 units) are placed in as many places as is possible to make the line tight, etc.

About Thin Spacing

If the line is too long. When all but one letter of a word or syllable will fit the measure of the composing stick in a line of type, the 3-to-em spaces (20 units) should be changed either to 4-to-em spaces (15 units) or to 5-to-em spaces (12 units). Very thin spacing, however, should be avoided when possible.

A Job Sheet for the Home Mechanics or the General Metal Shop

F. E. Tustison, Stout Institute, Menomonie, Wis.

There is a general objection to the electric toaster of the horizontal type. Unless special insulation is provided, the heat radiated downward affects either the apparatus itself or the table that supports it. The vertical type not only eliminates this difficulty but presents more surface for radiation, and is in other ways more satisfactory.

The following toaster frame was worked out in the home mechanics shop at the Stout Institute. The layout is suggestive, and can be changed to suit different sizes and designs. It works in nicely as a problem in sheet metal, either in the home mechanics or the general metal shop. The simple tools of the average home mechanics shop are all that are necessary. A second job sheet describes the making of the element and the electrical connections.

Job Sheet, Home Mechanics (Sheet Metal), the Stout Institute, F. E. Tustison.

JOB SPECIFICATIONS: To make a frame for an electric toaster.

REASON FOR JOB: We can now solder, rivet, and brake tin plate. Let us use these operations to assemble a frame for an electric toaster. Additional operations involved are bending and threading wires or small rods.

MATERIAL: One piece of IXX bright tin plate, 6¼"x20", No. 11 bright or coppered wire, 24 hexagon iron

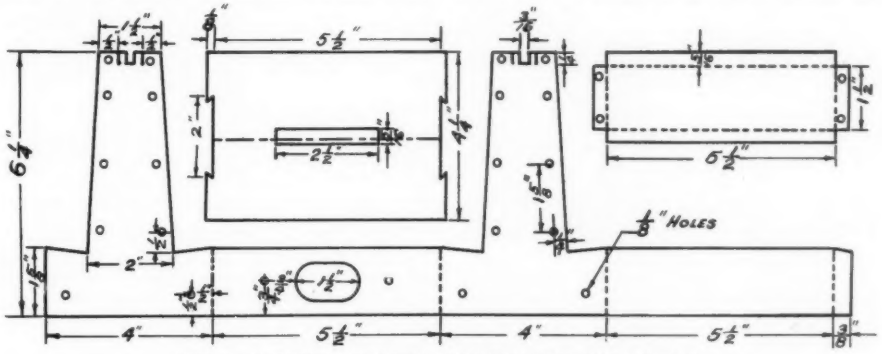


FIG. 1. LAYOUT FOR SIDES AND ENDS, TOP AND BOTTOM.

nuts 6/32, 4 round head ¼" iron machine screws and nuts 4/40, No. 24 spring brass wire.

TOOLS: Soldering outfit, vise, cold chisel, ¾" hollow punch, tin snips, stock and die to cut 6/32 threads, ⅛" drill bit or punch.

PROCEDURE: (1) Cut out the sides and the ends. (Fig. I.) Lay out directly on the tin plate, using a pencil or scratch-all. Perhaps, the instructor has a templet you may use. Cut carefully to the outline with the tin snips. Examine the enlarged drawing (Fig. II)

FIG. 2. TOP SHOWING CLIPS BENT IN.

of the top to get details. Note that the pieces remaining are to make the top and the bottom. Drill or punch the small holes. Punch out the two ¾" holes for the oval slot. Complete the slot with a cold chisel by clamping in the vise as per photograph (Fig. IV). This operation is called shearing. For a larger toaster increase the length in the layout.

(2) Brake and solder. Brake at all dotted lines in the vise. Take special care to make the corner brakes at right angles to the bottom line. *Use the try-square for testing this before the brake is made.* Unless this is

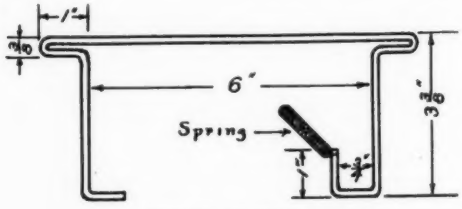


FIG. 3. DETAIL OF WIRE HOLDER.

done the toaster will not rest level. Solder at the corner. Brake the two clips at the top to the inside (Fig. II).

(3) Make the top and bottom. Lay out, cut, slot, and brake as before. Cut the rectangular slot in the bottom by clamping in the vise and shearing as before. Note that the slot is not in the exact center. Brake the bottom slightly in the center to conform to the dip in the

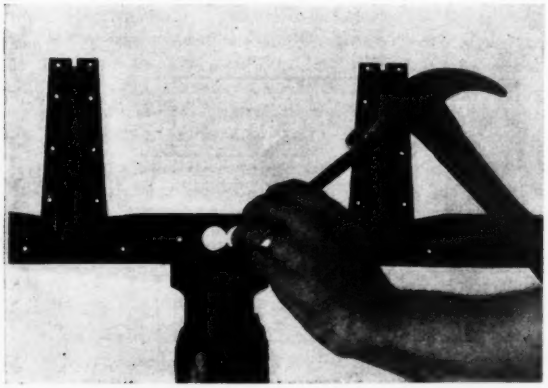


FIGURE 4.

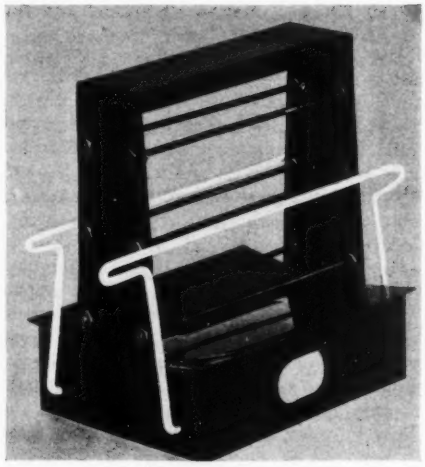


FIGURE 5.

frame. The sides and ends of the top are braked down on the dotted lines.

(4) Attach top and bottom. Fasten the bottom by soldering from below. If the bottom is to be hemmed, make it ⅛" larger all the way round. The top is fastened with four machine screws and nuts.

(5) Cut and thread the brace rods. Six rods are used to brace the frame and hold the toast away from the electrical heating element. Cut from No. 11 wire, length 5¾". Thread each end for ⅜" with 6/32 thread.

(6) Attach the rods. Insert the rods and fasten with two hexagon nuts at each end. It may be necessary to loosen the top if the rods are too long. Tighten the nuts so as to hold the end vertical.

(7) Bend the two wire holders. Use No. 11 wire (No. 12 wire will do and bend more easily). Bend as per drawing (Fig. III). Use the metal vise as an aid in bending. File or saw a deep notch, at the hook end of the holder, for attaching the brass spring.

(8) Insert the holders and connect with a brass spring. Wind a brass spring by winding the wire tightly around a ⅛" metal rod. The element winder used in the next job does this nicely. Attach the ends of the spring to the notches in the holder. Note that the spring is fastened underneath the frame and pulls both holders upright.

QUESTIONS:

(1) How do you thread a small rod?
(2) How can you get a square bend in wire?
(3) What is meant by 6/32 thread? 12/24 thread?
(4) Why do we not solder the top to hold it in place
(5) What use will be made of the slots in the bottom and side?
(6) What is the use of the clips at the top?
(7) How can the metal vise be used for shearing?

New Shop Courses. The senior high school at Dubuque, Ia., has added courses in machine shop practice and auto-mechanics. Mr. Harry Dempier, an experienced apprentice-foreman, has been placed in charge of the classes.

Smith-Hughes Evening Schools. The school board of Chanute, Kans., has opened a number of evening schools for the benefit of trade workers and home makers. This year, five classes for men, and five for women, have been established. The classes which meet twice each week, are conducted under the provisions of the Smith-Hughes law and are supervised by the state board of vocational education.

PROBLEMS & PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, pattern-making, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration.

LUMBER TICKET

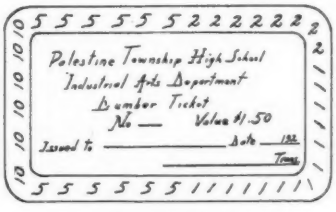
Richard Fawley, Palestine Township High School, Palestine, Illinois

In order to avoid such difficulties as have arisen in the past, in regard to the purchasing of wood in the manual training shop, we have devised the lumber ticket shown below.

These tickets are sold, to the students in the shop at the first of the year, for $1.50. In some cases the wood purchased by the student will exceed $1.50. If such be true, he is required to purchase another ticket.

Each ticket is numbered to serve as a check. A record of the name of the boy and the number of the ticket is kept in the office, in case any question should arise as to the rightful owner of a ticket. Each ticket has the signature of the treasurer to furnish a further check.

The ticket is kept in the drawer of the bench, for which each boy has a key. Each time the student takes lumber from the rack he has the ticket punched by the



LUMBER TICKET.

instructor; or if a check system for tools is used, the boy in charge punches the ticket for the required amount.

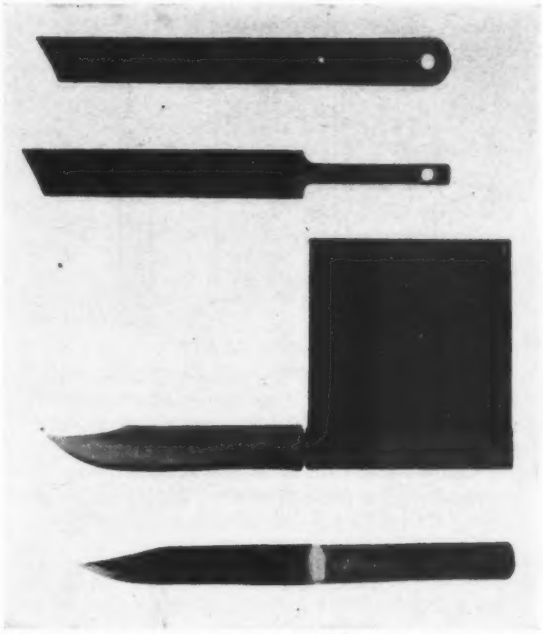
In this way no wood used is not paid for. This process encourages accuracy and thrift on the part of the boy. There is no trouble at the end of the semester about collecting for the various projects. The boys will keep more of their projects, due to the fact that they do not have to deprive themselves of something, in order to pay for the project.

A METAL SHOP PROJECT

J. M. Klaes, Dennis Junior High School, Richmond, Indiana

One of the projects meeting with success, and creating a great deal of interest, is a paring knife made according to the illustration. In our shop, the boy is expected to replace, or pay for, carelessly broken tools or equipment. Hack saw blades proved to be costly when carelessly handled, but now since we utilize the broken or wornout blades, the boys are eager to pay for the broken blades, which were formerly considered "dead horses."

A 12" power hack saw blade will make two knives, if not broken into too many pieces. The first step is to grind down the width of the blade at one end, care being



DEVELOPMENT OF KNIFE FROM BROKEN HACK SAW BLADE.

exercised to have the sides of the tang parallel. This is necessary in order that each layer of galvanized iron be wrapped about it evenly, and made to coincide with the previous layer.

The handle consists of a strip of 28 gauge galvanized iron 3¼" or 3½" wide, and 8" or 10" long. This strip of tin may be bent either in a bar folder or vise, in order to more readily start the wrapping of the handle. The tin may be kept tight and wrapped evenly, by inserting the loose end in the vise, and rolling the knife toward it, pounding each layer down lightly with a mallet. When sufficient metal has accumulated to form a neat appearing handle, cut the tin so that the end will be on the underside, where it can be soldered and not noticed.

Finishing (grinding the blade to the desired shape, and beveling for the edge) requires the most time. Since the blade is tempered for cutting steel, it is difficult to sharpen and whet. However, one is repaid by the splendid edge the knife will keep, and the praise of mother, who has the pleasure of using a knife which keeps an edge and which was made by her boy. The final finishing is done with emery cloth.

TURNED CHEST LEGS

Charles W. Frost, Bend, Oregon

The revival of interest in the "period" styles of furniture has created several new problems in methods of construction for teachers of wood working to solve.

Among these is the adaption of turned legs to cedar chests.

The usual solution consists of building the chest in the ordinary way and fastening the legs to its corners as shown in Figure 1. The legs are turned from solid (or glued up) posts, and the inside corner chiseled out, to fit the corner of the chest *after* the turning is done. This method is satisfactory in the results obtained; but, it involves an excessive amount of hard work, and requires the most skilful use of the chisel.

Figures 2 and 3 illustrate another method in which the hard work is reduced to a minimum, and by the use of which more accurately fitting joints are usually obtained.

Figure 2 shows three pieces of wood glued up to fit over the corner of the chest. "A" and "B" form the parts

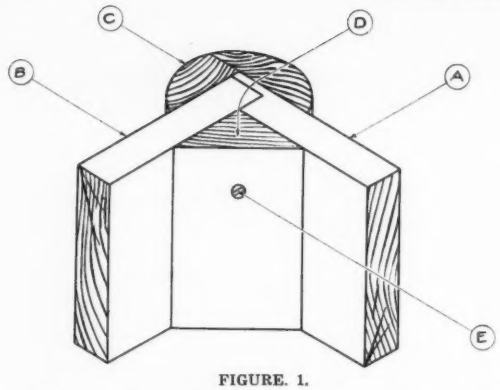


FIGURE. 1.

of the post adjacent to the front and end of the chest respectively. "C" is a block of the same variety of wood and forms the part of the leg upon which the weight of the chest rests.

Figure 3 shows the same post ready to turn. In this drawing "D" is a piece of waste lumber, and "E" a piece of thick cardboard—such as the back of a tablet.

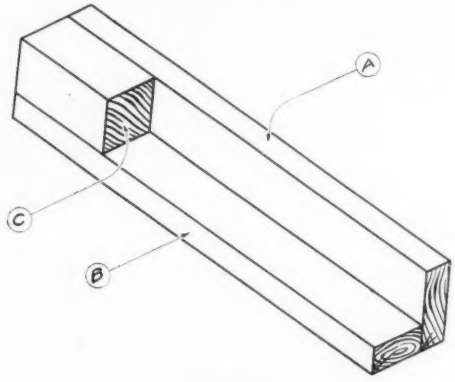


FIGURE 2.

Posts prepared in this manner are squared up as usual, turned to the required shape, and finished on the lathe. Upon completion of the lathe work, the filler piece, "D" is removed by splitting the cardboard, "E," with a

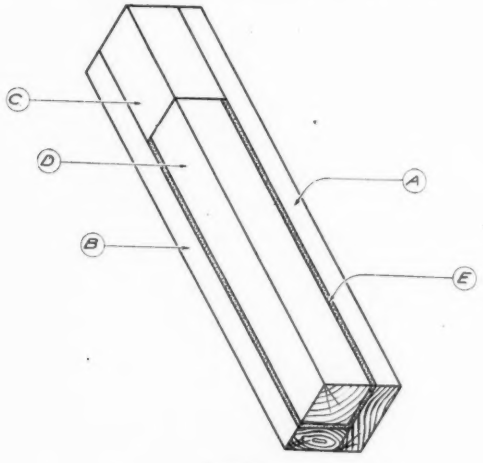


FIGURE 3.

sharp knife. A few minutes' work with chisel or scraper removing the shreds of cardboard clinging to their inner surfaces), renders legs turned out by this method ready to attach to the chest.

Explanation of Illustrations

Figure 1.
- A—Front of chest.
- B—End of chest.
- C—Turned leg.
- D—Cleat.
- E—Wood screw which fastens leg to chest.

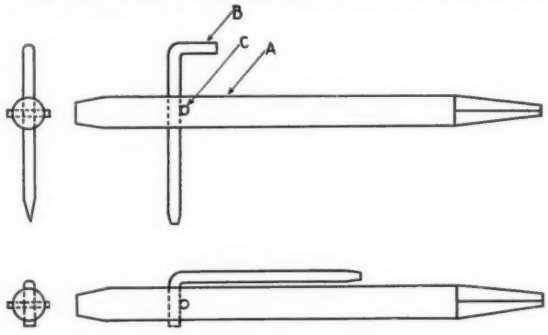
Figure 2.
- A—Section of post fitting front of chest.
- B—Section of post fitting end of chest.
- C—Section of post upon which chest rests.

Figure 3.
- A—Section of post fitting front of chest.
- B—Section of post fitting end of chest.
- C—Section of post upon which chest rests.
- D—Waste wood filler block.
- E—Cardboard.

A COMBINATION SCREW DRIVER

Harry Moore, Rosemount, Montreal, Can.

A tool that comes in handy on very many occasions in machine shop work, is the combined straight and bent screw driver shown in the accompanying photo and drawing. Sizes are omitted for the obvious reason that screw driver dimensions are, or should be, based on the particu-



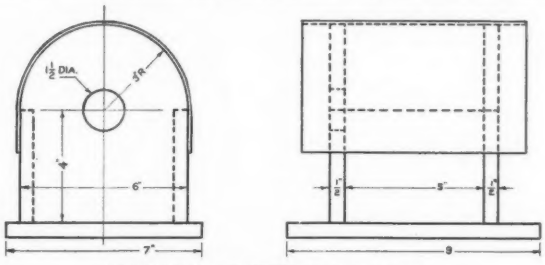
COMBINATION SCREW DRIVER.

lar kind of work for which the tool is intended: in other words, the universal screw driver has not yet arrived. The combination tool shown consists of three parts—A, the straight screw driver, B, the auxiliary bent one, and C, the pin that holds the two parts together. B fits a hole drilled in the shank of A, and is furnished with a flat on the side that comes in contact with pin C. When the short bent portion of B is held in the hole in A the auxiliary driver is in line with the shank and so out of the way when the tool is being used for straight work. To get around corners, as it were, the long end of B is slipped into place and tightened with the pin. It will be seen that B is capable of being adjusted in or out; a very desirable feature in a bent screw driver, as anyone will agree that has experienced the annoyance of discovering the usable end of a bent solid screw driver to be just a trifle too short to clear some obstruction.

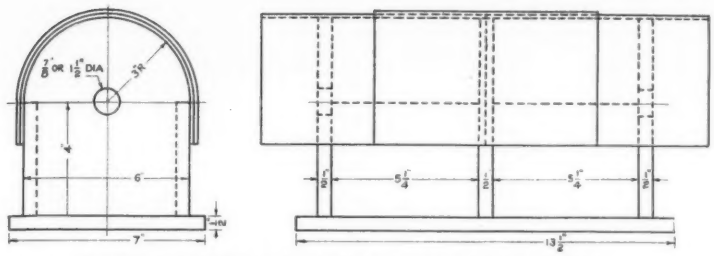
AN EASILY CONSTRUCTED BIRD HOUSE

Arthur O. Gardner, Madison, Wis.

A bird house whose construction is easy, yet one that is as good if not better, from the point of service, was designed by the writer in order that his poorer students might make satisfactory birdhouses. By eliminating the



DETAILS OF BLUEBIRD BUNGALOW.



DESIGN OF ROOMS ADAPTABLE TO WRENS OR BLUEBIRDS.

roofing problem, which necessitates the use of the T-bevel or the cut-and-try method, the problem resolves itself into one which makes use of the squaring up process, boring, and the scroll saw or spoke shave.

The house itself is a miniature imitation of the portable metal type garages which are becoming very popular. The roof is made from one shingle for the one-room house, or from three shingles for the double birdhouse. The room is of such size that the house may be used for either bluebirds or wrens. For wrens a 7/8" entrance should be made; whereas the bluebird requires a 1½" entrance.

If the house is built for bluebirds it is suggested that in placing the birdhouse that it be rigidly fastened to the top of a post. Cleats or braces of many types can be used for that purpose.

The construction of the birdhouse is as follows: 1. Square up base to size. 2. Square up sides to size. 3. Square up ends to size. 4. Lay out and saw out half circle on the ends. 5. Assemble. 6. Draw center lines on shingle. 7. Heat shingle until very pliable. 8. Put shingle on house. 9. Paint or stain.

The construction of the double house is very similar to the single-room house. These houses adapt themselves to the use of box wood, which can be obtained from local merchants. The shingle can usually be obtained gratis where houses are being built.

By nailing the ends to the sides and screwing the base on from below, it is possible to clean the house every fall by simply taking out the screws which hold on the base.

By putting two or three 3/8" holes in the rear piece, immediately under the roof, ventilation is provided.

Blue Bird Bungalow:

2 pcs. ½"x6"x7" Pine or Boxwood.
2 pcs. ½"x4"x5" Pine or Boxwood.
1 pc. ½"x7"x9" Pine or Boxwood.
1 asphalt shingle 8½"x12½".

House for Blue Birds or Wrens:

3 pcs. ½"x6"x 7" Pine or Basswood.
4 pcs. ½"x4"x 5¼" Pine or Basswood.
1 pc. ½"x7"x12½" Pine or Basswood.
3 asphalt shingles 8"x12½".

For wrens, the entrance should be 7/8" in diameter and for blue birds 1½".

FLOOR SWIPE

Charles M. Rice, Everett, Wash.

The floor swipe is used to dry the floor after it has been washed, and is useful for windows. A piece of ¾" dowel stock may be used for a handle, or the boys may supply broom handles.

PIONEER WORK IN APPRENTICE TRAINING

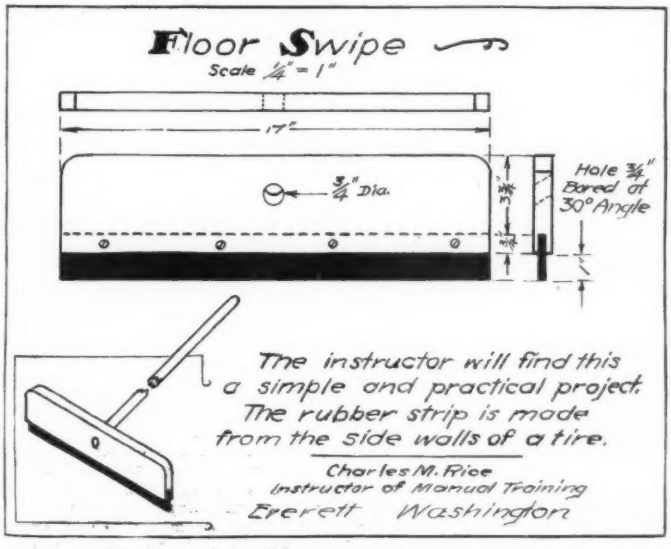
The Boston Society Hears an Account of the G. E. Work at Lynn

At its well-attended monthly luncheon meeting at Healy's Hotel, December 13, the Vocational Education Society of Boston had the privilege of listening to a stereopticon talk by Mr. C. K. Tripp, director of apprentice training for the General Electric Company, Lynn.

The General Electric Apprentice School is not only one of the earliest attempts on the part of any large corporation to provide formal training; it is preeminent also through its success and its size. It has turned out, during the more than twenty years of its existence, a thousand graduates; and it has a present enrollment of 350 apprentices. Among its graduates are fifteen men who are now engaged in public vocational or manual-training education, and two of these men are directors of schools in Massachusetts.

It was in 1902 that the training program was established. At that time there were twenty or thirty boys employed in the various departments of the Lynn plant, chiefly on work requiring a minimum of skill. It was customary here as elsewhere for foremen to keep boys upon a single class of work in which they had attained a profitable proficiency, rather than to attempt to give them rounded experiences at the expense of production. Mr. Tripp began his department as an evening school for these boys. He had to face the skepticism not only of the foremen and older hands, but of the boys themselves. The evening classes, after a trial of several months, were found to be not feasible, since they lengthened unduly the day of the apprentices, who were inclined to resent the required attendance.

From the consequent shifting to day classes, in which shop work as well as theory was handled, to the present, the progress of the school has been along very definite lines. One of the first tasks which confronted Mr. Tripp was to convince the executives that actual production work could be turned out by the boys under his instruction. With an equipment consisting of a few old machines which had been "junked" from production departments, the school was able to make good its claim so convincingly that new, up-to-date equipment was soon authorized. Another victory for the training department was its demonstration that it was perfectly capable of handling high precision work. This was achieved by demanding of the boys an accuracy as high as two-tenths of a thousandth on the "rough" machining of work. This meant that any error would not, therefore, spoil the piece; but in the meantime the practice was developing the skill which would enable the apprentices to perform the finishing operations to the required precision. So good a record, indeed, did the boys make that certain precision parts are considered the prescriptive right of the training department, and are customarily produced there through choice.


Floor Swipe
Scale ¼" = 1"
17"
¾" Dia.
Hole ¾" Bored at 30° Angle
The instructor will find this a simple and practical project. The rubber strip is made from the side walls of a tire.
Charles M. Rice
Instructor of Manual Training
Everett Washington

DETAILS OF FLOOR SWIPE.

The department as now organized has ample and ideal quarters and has great importance from the productive as well as from the educational standpoint. It offers various courses, as in pattern-making, machine work, sheet metal, testing, drafting, and die-making. The courses are normally four years in length. For high school graduates this is shortened to three years; and special arrangements are made for graduates of technical institutions. The alumni have a strong organization and a great deal of "school pride"; this, and the obvious value of the school's training, make it possible to exercise careful selection of pupils. Only three or four out of every twenty applicants are accepted. As between grammar school graduates and those from higher institutions, the advantage is not always with the latter. Mr. Tripp is of the opinion that in learning human nature, as a basis for executive work, the boy who learns his trade first and extends his general education afterwards, is pursuing the wiser course. Non-shop instruction is given in the school in drawing, mathematics, and English, the emphasis following the order of mention. In addition, the shop instruction is not entirely specialized in the field covered by the boy's course; a variety of shop experience is considered the prerequisite of a firmly-based training.

The success of the instruction given is attested by its results. Scores of the graduates are now occupying high executive positions with the General Electric and other firms. Many are successfully in business for themselves. That only 55 per cent of its graduates are still in the employ of the company, is not considered a fact to be deprecated. Many of those who have left are in high position with other electrical concerns. The General Electric does not attempt to discourage its graduates from making the most of their training and rising as far as they can. Indeed, of the graduates from the testing course, a very large proportion are now employed by service companies, such as the Boston Edison, who are customers of the General Electric. This is considered a legitimate aim of the school.

The department has abandoned one aim, however, which it originally held: that of training routine mechanics for its own shops. The records show that not over ten per cent of its graduates are still working at the bench or at a machine two years after graduation. The rest have risen in that time to foremanships or other executive positions. It is felt that in training men for these jobs the department is fulfilling its highest function.

Mr. Tripp illustrated his talk with many lantern slides showing the department at work and samples of its product. The talk was particularly appropriate and timely, since the subject of apprentice education has come so much to the fore during the past few months in this vicinity.

The next meeting of the Society, on January 10th, will be held in the evening. It is the annual "get-together" and business meeting, and it is hoped that a large proportion of the 250 members will be present. The speaker has not yet been announced.—Frederick Ames Coates.

HIGHLIGHTS OF THE NATIONAL SOCIETY FOR VOCATIONAL EDUCATION MEETING AT INDIANAPOLIS

Ray F. Kuns

"Why continue this vaudeville called education when it does not serve?" This was the closing challenge hurled at the six hundred and twelve guests surrounding the boards at the annual banquet of the eighteenth convention of the National Society for Vocational Education, by Mr. Roger W. Babson. Why indeed! Schoolmasters were casting glances at schoolmistresses, but they were not the age-old glances of man and maid of song and story. Forgotten for the time were the splendid banquet and the remembrances from Santa Claus with which we had been making the welkin ring. Instead of humor and good will eyes were now flashing an answering challenge to the speaker, staring ahead in fear or seeking consolation in the faces of fellow guests and teachers, most of whom wore an expression of dumbfounded amazement.

Knowing the reputation of the speaker of the evening, most of those present had expected to see some sparks fly as he heated the iron and plied the hammer in forging the links of the chain, but that the chain should prove to be one used to shackle so many of our fond ideas and practices came as somewhat of a shock to many. A few weeks before, when he had talked in the Queen City and told the city fathers that they were sleeping over a gold mine, some schoolmasters had crowed over their soundly berated friends in industry. But now the shoe was on the other foot and a bit tight in the toe. The corn of conceit was being pinched and this, too, seemed to suggest a change in the weather. Of course, storms come and go in this educational phase of our mundane existence and one squall more or less has no particularly lasting effect, although it may help to clear the atmosphere for sane and clear thinking. That Mr. Babson did set people to thinking goes, beyond the shadow of a doubt. Sorry to say, some people talked and some papers quoted without any particular attempt at thinking the thing through, which is to be regretted. In another point the reaction of the thinking school people is presented as summed up by Dr. Prosser.

For the benefit of the reader who could not attend the convention, the general trend of the attack on all forms of modern education is condensed in the following notes. Inasmuch as these notes cannot be exact quotations they are not so presented. As a compliment to the assembled educators upon whose scalps Mr. Babson must even then have had designs, he first told the assembly that they were engaged in a most noble work and blazing a trail for a more useful and worth while education. Assurance was given that when history is written the first chapter in the first volume of the educational writeup will contain the names and accounts of the deeds of all assembled at the banquet.

After a short description of his establishment in which he spends one and one-half millions of dollars yearly to test the pulse and take the temperature of the businesses and industries of the country, Mr. Babson assured the guests that anything he might say had no personal element or even vestige of personal opinion in it. A long term of years of investigation had convinced him of the exactness of the statements which he proposed to make. According to Mr. Babson:

The start of all education was when the missionaries taught the savages *integrity*. Trust in their fellowmen led to the initial start in industry. Many things may be taught but integrity is fundamental, as are also *selfcontrol, courage, faith, and a desire to serve.*

Vocational education is like building a tool and sharpening and double sharpening it. The teachers are so busy with the construction of the tool that they are unable to take time to teach the use of it.

The entire system of public education not only lacks the fundamentals necessary to the upbuilding of the nation as a whole, but lacks those qualities essential to the building of a personal success as well.

A student leading a class has never been known to make a success, such as might be indicated by this feat.

Education is not delivering the goods. Youths spend the best portion of their lives committing to memory certain things. These things do not make for success, and might be compared to the paint upon the walls, but need never be mistaken for the building or foundation or walls which bear the burden.

Men who do things are not the product of the schools. Our farms produce leaders who never saw the inside of a high school. They are the sons of poor fathers and have had little education. Cities secure their leaders from the rural districts, and no one born in our largest city ever does amount to anything.

Part-time high schools are good and the sooner we come to this type of education the better. Industry must be taught.

Too many people try to get on by their wits and not by work. Self-made men are made by work, they are not afraid of it. If not willing to work it is better to get out.

Success is only won by concentration; do not spread out, stick to the point and make that point as fine and sharp as a needle point.

Cultivate initiative.

That intangible something known as spiritual power, industry, initiative, self-control, integrity, courage, faith; these are the foundation of success, national or personal.

And then, "Why continue this vaudeville called education when it does not serve?"

Dr. Prosser Sums Up

Voicing a protest at being made the goat for the eighteenth time at the close of the eighteenth annual convention of the National Society for Vocational Education, Dr. "Charlie" Prosser came up with a smile. If we were willing to grant, and we certainly are not, that there was the semblance of truth in this appelation which Dr. Prosser assumed for himself, then we might not be wrong in assuming that some one was likely to be "butted round" a bit. After commending the city of Indianapolis, the

Claypool Hotel and all Hoosiers in general for their hospitality, he referred to the eleventh annual convention held in the same city. Dr. Prosser seemed to leave the impression that in this, the eighteenth convention, the Hoosiers had outhoosiered themselves and that is certainly more than mere goatly wisdom.

Dr. Prosser drew a marked contrast between the 125 people gathered at the eleventh annual convention banquet when the pioneers of vocational education sat around the tables awaiting the word from Washington that the Smith-Hughes Act was a reality. He told how they had discussed the ways and means, the why and wherefore, and the possibilities of the new law. He mentioned the preponderance of men from industry present at that meeting and regretted keenly that they were not present at the last annual banquet. Instead of men from the industry there were present men and women teachers and supervisors who have been called into the field of vocational education in order to administer the law. Admitting that the schools must work out and administer the law as their rightful duty, the keenest of regret was expressed that the men from industry were not included in the meeting to a greater extent. Somehow or other they must be brought back.

It is very fortunate that one of the largest audiences of the convention was assembled for the close of the session and heard Dr. Prosser's comparison of the seriousmindedness of the eleventh convention and the frivilous mindedness of the eighteenth and last with particular reference to the "doings" at the annual banquet. We were made to feel about our actions a few evenings before about as we would imagine our mothers would feel about the flappers of today. But we were not the only ones who got "butted round." Referring to the one who brought the address to the annual banquet assembly, he likened him to one "schooled in the affairs of the market." He suggested that if Mr. Babson had had time he might have continued his remarks and offered some helpful suggestions. Since Mr. Babson, however, had not offered these suggestions, Dr. Prosser felt that some one should, and accordingly proceeded to give them. Again we are unable to convey exact expressions, but will try to hold to main ideas.

The important thing is not cultural education, the important thing is not vocational education but the important things are men, schools, and industry. *Courage, integrity, honesty, faith, and selfcontrol* are the fundamentals and the foundation and Mr. Babson is right. These things can not be secured by preachment. Nor can they be secured by facts. Preaching against wrongs does not establish virtues. Cramming pupils with facts does not inculcate courage and other virtues. At the heart vocational schools are as good as our regular high schools. The only way to get courage, selfcontrol, and integrity is through experiences and thinking through to both mental and physical habits.

The convention gave Dr. Prosser their hearty applause at the conclusion of his remarks, and let it be recorded here that if "Uncle Charlie" is to be the goat next year I want to again be one of the kids and be "butted round" a bit for my personal edification.

Highlights of the Meeting at Indianapolis

"When the frost is on the pumpkin and the fodder's in the shock" is the time to hie yourself away to Hoosierland, especially if there is a convention of the N. S. V. E. on and more especially if there is to be a banquet or entertainment put on by the Hoosiers. Then, again, if you want to hear a noise reminding you of "the gobble gobble of the struttin' turkey cock," you want to be present when Santa Claus brings on his Christmas trees and each guest finds himself supplied with a horse, fiddle, horn, whistle, or other means of relieving the nervous tension which is the natural result of unnatural inhibition while engaged in the task of teaching or administering vocational education.

When driving from Cincinnati to the capital of Hoosierdom, we had passed through "Riley's Little Town of Tailholt," and on Thursday evening gathered in the Riley room of the Claypool, 612 strong. Seven years before the same Association had assembled in the same hall, but we are told that it was certainly not the same crowd. In fact, that crowd of industrious people from industry, with a sprinkling of teachers could not begin to compare with this crowd composed of schoolmasters and schoolmistresses with a sprinkling of people from the industry, in friviolousness. However, what we lacked in quality we made up in the quantity of the noise we made.

Looking about the Riley room one could see panels in which were painted some excerpts from the works of that illustrious and most human poet, Mr. James Whitcomb Riley. I almost said that Hoosier poet but you know Mr. Riley belongs to all of us, although he did make Indianapolis famous, along with the help of her vocational educators.

There is ever a song
Somewhere my dear
There is ever a song
Somewhere.

This was one of the little verses appearing on the panels, and it spoke the literal truth. Somewhere might have been read right there so literal was the application; for there was ever a song on the air.

Following the songs rendered by the quartet, the banquet hall was cleared and staid schoolmen and schoolmaids proceeded to trip the light fantastic toe. All meetings started an hour late on the Friday program.

Friday night was Hoosiers' as hosts' night. Pat and the Judge did great work as entertainers. The fact that many of their stunts bore the earmarks of another generation made them none the less welcome or amusing. They made us think of another of the verses on the panels in the Riley Room, although this meeting was in the assembly hall:

But the merry days of youth
Is beyond our control
And it is hard to part forever
From the old swimmin' hole.

Again the chairs were pushed to the wall and on Saturday all sessions opened an hour and a half late.

The Ship Makes Port

Any account of the activities of the N. S. V. E. would be incomplete without mention of the Ship. This good vessel made port early and all hands were on deck as well as the captain, mate, purser and chief mechanic, to welcome the school folks and prospective passengers. Snug in the harbor of the Palm Room the crew was more than busy explaining the workings of the Ship. The fact that the crew was worked by the school folks was not unexpected nor was the feat particularly difficult. Many a good wife now uses a new steel tape to measure a perfect thirty-six whilst the baby uses a nice new eraser for a toothing ring, junior tries to saw a rung from the best company chair with a miniature saw, Susie develops an individual art with her new pastel crayons, big sister paints a new picture with new paints and father tries a certain round brush with the idea of seeing how well it works on his old kelly. Yes, there was a present for each one in the family, if you stayed on deck long enough.

Dr. Arthur Payne, in connection with the crew, accomplished a hitherto unheard of piece of work. Under the guise of something for nothing, all guests present were led into a situation where they allowed themselves to be subjected to an intelligence test. Whoever heard of the testers being tested? Yet its accomplishment was supremely easy. The fact that it succeeded reminds one of the days of a certain Mr. P. T. Barnum and his pet philosophy.

Each stateroom of the Ship was fully decorated in attractive fashion and a deck hand was in charge. Placed well to the front of the exhibit was the promise of fabulous riches if you could guess the answer to that particular part of the intelligence test. These individual parts or questions were numbered from one to eight hundred and thirteen. A little book of coupons was given each member of the Association for the sum of two dollars. This is a sort of membership or initiation fee, but ought to be easily won back if your I. Q. is high enough.

Starting in at booth number one you simply guessed how much red twine was in a certain ball contained within a certain glass jar. Next you guessed the number of cookies in a jar; for the fun of it if you were a man, and on the chance of winning a can of baking powder if you were the wife of a man who likes biscuit. Next you took a chance on reading a catalog of books to see which title Santa Claus had put in an envelope, and maybe you would get the book or a magazine, and so on and on. One time you were counting shavings and estimating the number you could not see and the next thing maybe you hefted a jar of wood and leather to see what it weighed, or estimated the number of nails, rivets, rocks or whatnot in various jars in ditto staterooms.

At one point you would see a mathematician figuring diligently on the sum of a lot of figures none of which

were more than nine and looked like a Chinese puzzle, while at another point would be found two or three domestic science teachers and a like number of supervisors' wives matching colors.

On Friday night at seven o'clock Dr. Payne announced the result of his intelligence test. This was the first that most of us knew about that feature. As was to be expected all those born on the farms stood highest and those coming from New York and trying to live by their wits alone and unwilling to work industriously and courageously at counting and estimating the possibilities of the case were at the lowest rung of the I. Q. ladder. In fact, Dr. Payne having attended the banquet of the night before, and knowing the high school and college records of all those being tested, refused to even examine the records of any contestant who had ever been inside a high school, and as for college graduates, they were anathema. For all this it is passing strange the number of supervisors and directors who took away more than one prize, and as for the college professors and teacher trainers, my good friend Prof. Whitcomb of Miami carried home two, a saw and I know not what else. All of which proves that you can not prove anything.

NEW YORK SCHOOL CRAFTS CLUB

The program of the School Crafts Club for the December meeting consisted of four round table discussions. Thus, one attending was able to get in on the subject of greatest interest to himself. The club met on the evening of December 20th, at the Terrace Garden, 145 East 58th Street, New York City.

The following new members were accepted:

Mr. Herbert Bobelin, West Hoboken, N. J.
Mr. Arthur Rendall, Summit, N. J.
Mr. Leonard Skalnick, Newark, N. J.
Mr. Harry A. Lushear, Newark, N. J.
Mr. Albert F. Pardee, Union, N. J.

Mr. John Vomaker, C. E., of New York City, spoke on the subject, "Some Standards that the Drawing Room Requires." He dwelt upon lettering standards, line standards, and note filing systems. Mr. Vomaker does not favor laborious lettering plates as the proper means to teach lettering and numbers. He believes the results are as good through the practice which comes indirectly by careful lettering in note taking. Many pupils make dimension numbers too small. They must be of sufficient size to be read easily. The Rineheart system is the standard in machine drawing. Information and standards for line drawing are well covered in French, "Engineering Drawing." On note taking and preliminary sketching Mr. Vomaker recommends 8½"x11" paper as it is filed readily.

Mr. Frank A. Panuska, of Teachers College, Columbia University, would also have spoken at the table on mechanical drawing had not a serious illness prevented.

The table on shop problems was led by Mr. Thomas Darling and Mr. Julius Singer, both of New York City. Mr. Darling discussed the method he uses with a project such as a bookrack. He has individual blue print working sheets. Different steps in the process are checked as the pupil progresses. Each project stresses: (1) Materials, tools, operations; (2) suggested jobs to which same operations may be applied; (3) trade mechanical information, as drafting, mathematics, science, and trade terms; and (4) auxiliary information, as safety and hygiene, vocational guidance, and English. Mr. Singer's subject dealt with the split pattern problem in wood pattern-making. He brought before his hearers in an interesting manner the processes, tools, and materials necessary. Mathematics and drawing are important in designing a pattern that is successful. Mr. Singer explained in detail how the stock is gotten to size, dowell jointed, fastened, turned, and finished preparatory for use in molding.

A discussion on "testing" was led by Mr. Julius Eisenstein of New York City. He spent some time in unfolding a history of the development of testing. The subject matter for tests must come from the daily work of the pupils. Tests are a means of drawing questioning down to a science. In order to standardize tests they must first be tried on a large number of children and then revised to discard questions that are too easy and to arrange for grades so that the harder questions come in more advanced years. True and false tests are still a matter of luck in guessing, despite claims to the otherwise. Tests should be hard enough so that one hundred per cent is not possible. The forms of tests in use are: (1) The checking of a question as true or false; (2) the completion of sentences with words left out; and (3) checking the correct answer from three or more choices. The purpose of tests is to find out (1) what children know when they enter a given grade or start with a given teacher; and (2) to find out what a given teacher has or has not put across after a lapse of time. Thus, an important function of tests is a check on methods by the teacher himself. The Patrick tests are adapted to diversified shop work. These tests are to find out how much information has been acquired by a student from his work in industrial arts. Mr. Patrick has twice revised his questions following use in schools throughout the country. These tests may be obtained through officers of the School Crafts Club of which Mr. Patrick is an active member. Mr. Patrick feels that our aim as teachers of industrial arts should be to get over to the pupils industrial information, some degree of skill, and promotion of originality. Mr. Eisenstein recommends that shop teachers work up test questions which are adaptable to local conditions. They can be used for years with very slight alterations after a few revisions at the first trials.

Mr. Frederick C. Arnold, president, announced as the meeting adjourned, that the January meeting will be of a similar nature with the popular round table discussions.

—Lloyd F. Stair.

CONFERENCE OF MANUAL ARTS TRAINING INSTITUTIONS

The Fifteenth Annual Conference of Representatives of Manual Arts Teacher-Training Institutions in the Mississippi Valley was held December 4, 5, and 6, at Purdue University, Lafayette, Ind. The attendance, which covered a large territory, included five from Illinois, five from Indiana, two from Minnesota, one from Missouri, six from Ohio, two from Oklahoma, one from Pennsylvania, one from Tennessee, and two from Wisconsin.

The conferences covered intensively specific topics in industrial education, among which were the following:

1. What should the prospective teacher gain from contacts with industry?
2. Cooperation between teacher-training institutions and public officials, in promoting professional improvement of teachers on the job.
3. Reports from institutions.
4. Objective tests and measurements as applied to manual arts and industrial arts subjects.
5. Teaching a university class of advanced students.
6. Plans for conducting an occupational survey of a local community.
7. The individual instruction sheet.

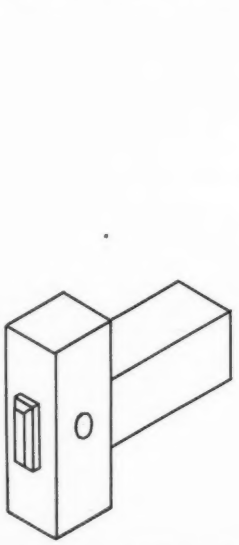
The next meeting will be held at the call of the chairman, Dr. W. T. Bawden, at Chicago, Ill.

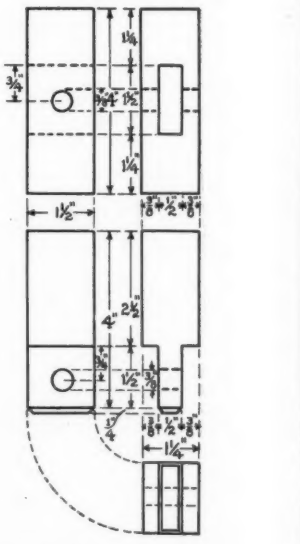
NOW, ARE THERE ANY QUESTIONS?

Pin Mortise-and-Tenon Joint

Q. Please send four blue prints of through pin mortise-and-tenon joint.—M. C.

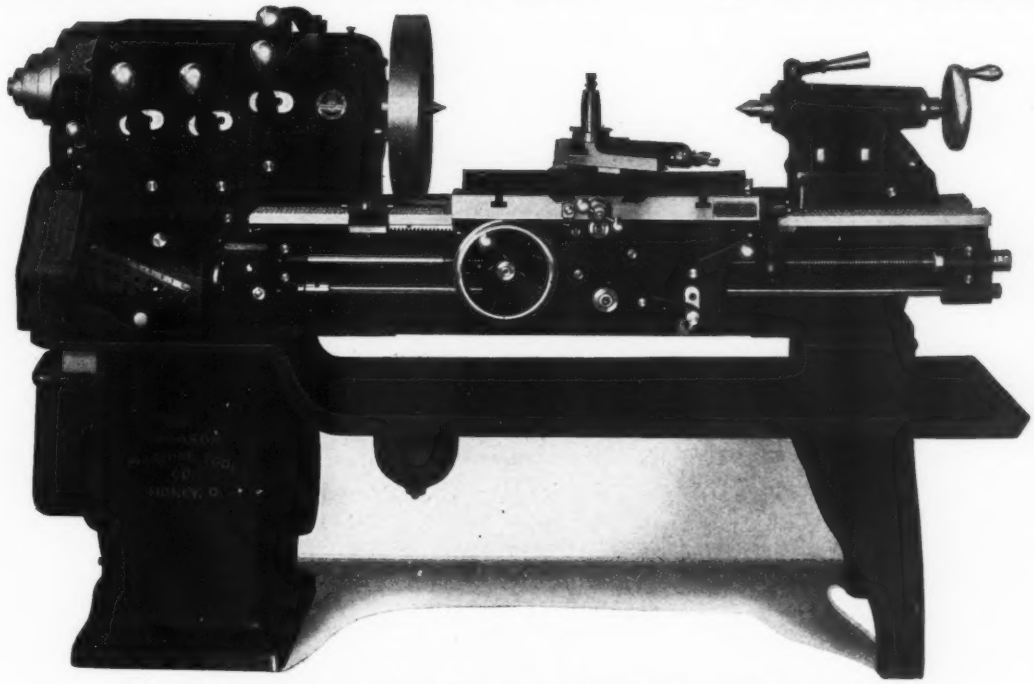
A. The illustrations from Rusch & Conway's "Shop Work" illustrate very clearly the construction of a pin or





doweled mortise-and-tenon joint. This joint is also illustrated on page 184 of King's "Elements of Woodwork," and on page 63 of Evans Brothers' "Woodwork Joints." The preparation of blue prints of this joint may form a drawing and tracing project for an advanced boy.

Silent - Smooth - Powerful



14" x 6' Monarch 8 Speed Self-Contained Motor Drive Lathe With Chrome Nickel Steel Helical Gears and Ball Bearings in Headstock. Motor and All Wiring Inside Cabinet Leg.

These MONARCH lathes are the very last word in design and efficiency and adaptability for Vocational School use. The helical gears in the headstock are absolutely noiseless. Four large ball radial and six ball thrust bearings in the headstock eliminate friction and prevent wear.

The motor is mounted inside the cabinet leg where it is protected from oil and dirt, and all electrical wiring and connections can be housed inside the cabinet leg. Drive is through endless belt with adjustable ball bearing idler pulley.

The only noise made by the helical geared MONARCH lathe is the swishing of the oil in the headstock. Operation of the entire lathe is fool proof. If desired a heavy glass cover plate can be put on top of headstock making the inside visible.

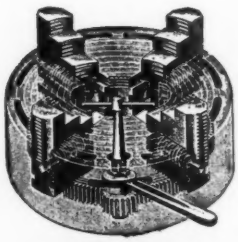
MONARCH lathes are standard equipment in many of the best production shops and tool rooms. Our large production enables us to offer these lathes as the very finest lathes ever offered for Vocational School use and at prices within the appropriation limit of those schools desiring good machine shop equipment.

We will gladly send you catalogue and special bulletin describing these new lathes.

America's Largest Builder of High Grade Lathes

The Monarch Machine Tool Company

404 OAK STREET SIDNEY, OHIO.



WESTCOTT'S
SPUR GEARED SCROLL
COMBINATION LATHE CHUCK

Sheer Quality

Just as Cadillac, Pierce-Arrow, Rolls Royce and Packard typify the best in automobiles, so is the name "WESTCOTT" synonymous with the best in Lathe and Drill chucks.

We do not claim that our young folks will be any better "grown-ups" for having ridden in the world's finest motor cars, but we *do* say that the boys who are brought up to use WESTCOTT CHUCKS will have a good chance to become more expert mechanics—the quality of Westcott Chucks will inspire them to do their work in a superior manner.

On a basis of quality, therefore, we respectfully ask you to investigate Westcott Chucks—a postal card will start a catalog your way.

WESTCOTT CHUCK COMPANY, Oneida, N. Y.

Manufacturers of Lathe and Drill Chucks since 1873

NEWS AND NOTES

Correspondence Course in Printing. A correspondence course in the printing arts has been begun at Indianapolis, Ind., under the direction of a newly-organized bureau of education of the International Typographical Union. It is in charge of Mr. John H. Chambers, of Dayton, Ohio.

The new bureau has installed methods for checking the progress of apprentices in their studies and for determining whether they have actually profited by the work offered.

In addition to the technical operations of the printing craft, the course carries instruction in English, punctuation, art in relation to printing, and advertising composition. Student apprentices are permitted to select subjects not included in the fundamental course. Educational work is provided also for journeymen, who wish to perfect themselves in advanced phases of the printing art.

County Takes Staffs of Trade Schools. Following a period of uncertainty as to the terms of transfer of teachers from the city vocational schools of Newark to the Essex County, N. J., system, an arrangement has been entered into under which the present staffs of employees of the three schools will be taken over January first from the city board of education. There will be no change in salaries and the contracts will run from January 2nd to June 30th, inclusive.

Under the arrangement, the county board of Essex County will keep the teachers until July first, and if they prove efficient, will be continued on the several staffs as in the past. Under the tenure law, the teachers are required to earn their tenure again by three years of satisfactory service.

Beloit Vocational School. A new two-story vocational school will be erected at Beloit, Wis., at a cost of $160,000. Messrs. Merman & Skogstead, La Crosse, Wis., are the architects.

Evening Vocational Courses. Evening courses in sheet metal, mechanical drawing and shop mathematics are being offered this winter at Anaconda, Mont. All students must be at least sixteen years of age before they are admitted to the classes.

Vocational Part-Time Classes. The establishment of part-time vocational classes for boys and girls sixteen to eighteen years of age, employed under working certificates, has been authorized at Springfield, Ohio. A total of four hundred boys and girls are affected by the operation of the school.

Vocational Conference. Director Robert O. Small, of the division of vocational education of Massachusetts, recently conducted a conference for directors of vocational education from all parts of the state. A total of 48 schools in the state were represented at the conference, which included a general meeting and several group conferences for the discussion of specific problems in vocational education.

Hold School Sale. The Girls' Vocational School of Newark, N. J., in December, held a sale of school products, including millinery, home needlework, baking and candy. The proceeds of the sale were turned over to the board of education. Beginning with the new term on January first, the school became a part of the vocational school system of Essex County.

Boys' Vocational School. Construction work has begun on the foundations for the four buildings of the boys' vocational school at Osceola, Wis.

Evening Vocational School. An evening vocational school for shop employees has been established at Bucyrus, Ohio. The classes began with courses in mechanical drawing and shop mathematics.

Propose Vocational Guidance. A vocational guidance department, in charge of an expert counsellor, has been proposed at Schenectady, N. Y., to act as a mediator between the student and his future outlook upon life. It is pointed out that many students leave school before they are fully equipped to pursue a given course of endeavor in life. Proper counsel at this period would eventually show that additional study and preparation might not only be necessary but highly advantageous.

Improvements in Manual Training Shop. Additions and changes have been made in the manual arts department of the junior high school at Aberdeen, S. D. The high school manual arts classes have been moved to the junior high school, where well-equipped shops for woodworking have been provided. The general shop practice department offers work in electricity, sheet metal work and concrete construction. The mechanical drawing room has been well equipped for both junior and senior high school classes.

Itinerant Plumbing Instruction. Provision will be made in the near future for itinerant plumbing instruction in cities of northeast Wisconsin as a feature of part-time educational activities in the state. The plan, which has the cooperation of the Wisconsin Master Plumbers' Association, the Journeyman Plumbers' Association, local boards of industrial education, and state departments, will provide for classes in Green Bay, Appleton, Oshkosh, Fond du Lac, Sheboygan, and Manitowoc. The classes will be only for those already in the trade and will not be open to those desiring to go into the trade.

To Decorate New Schools. The Chicago Public School Art Society has made plans for placing a fine picture in each room of the 165 new schools to be built under the board's new building program. The organization, since its beginning thirty years ago, has succeeded in furnishing pictures for 172 out of the present 300 schools, as a stimulus for better artistic appreciation among the pupils.

Evening Vocational Classes. Evening classes are being held two evenings each week in the schools of McComb, Miss. The instructors are foremen or other technically educated men from the various industrial institutions. The subjects include car shop drawing, air-brake operation, boiler making, sheet metal drafting, and shop mathematics.

Trade Classes. Classes in carpentry, electricity, sheet metal work, plumbing and brick-laying are held at Akron, Ohio, in connection with the evening school work.

New Vocational School. The new vocational school at La Crosse, Wis., was dedicated on November 20th. The building is one of the finest of its kind in the state and cost $232,000.

Electrical Works Department. An electrical department has been opened at the Madison, Wis., vocational school. Mr. Floyd Brieze, the head of the department, is an experienced journeyman and has had considerable teaching experience in vocational schools. The department is equipped to take care of eighty students.

Among the subjects covered in the course are house wiring, motor study, radio, battery work, and lighting and ignition.

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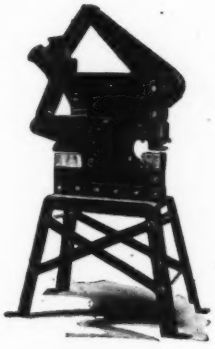
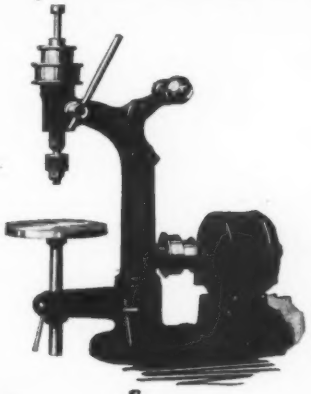
"Buffalo" Equipment for the School Means Low Repair Costs Good Work and Satisfied Instructors



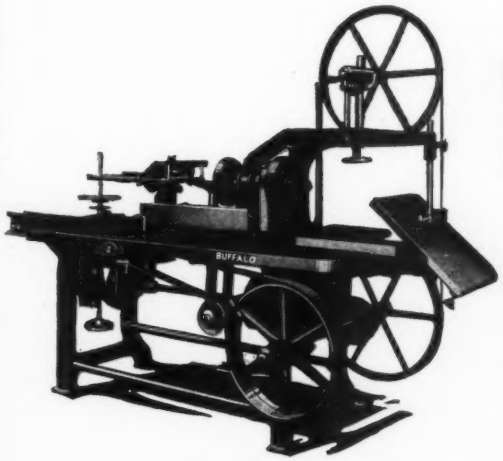
Vocational schools find "Buffalo" equipment most satisfactory. Forges, drills, woodworking machinery, blowers, and the famous Buffalo "Armor-Plate" hand and power-operated punches, shears and Bar Cutters will be found in many schools; where repair costs are low and students turn out good work. Instructors say that the quality of the equipment makes a real difference in the way it's handled.

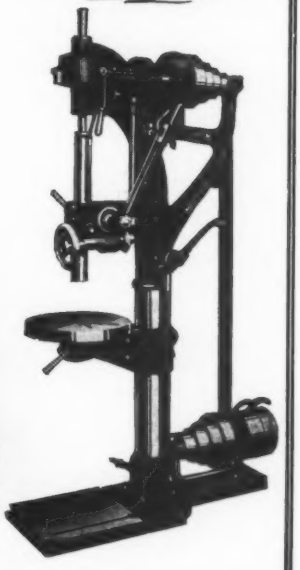
Many of these schools are warmed and ventilated by a Buffalo Heating and Ventilating System; the most perfect obtainable.

Write to us for information about any of these machines.



Buffalo Forge Company
482 Broadway Buffalo, N. Y.





Why are Starrett Tools Standard in every Shop

In something over forty years the Starrett Line has increased from a single tool, the famous Combination Square, to include over 2200 different Precision Tools, Hacksaws and Steel Tapes. Those years have seen the growth of a business that now requires the largest plant in the world devoted exclusively to the manufacture of fine mechanical tools.

From the first mechanics to whom Mr. L. S. Starrett sold his Improved Squares and Rules, the roll call of Starrett Users has grown year by year until today every country in the world which uses machinery and precision tools knows Starrett as the standard of accuracy.

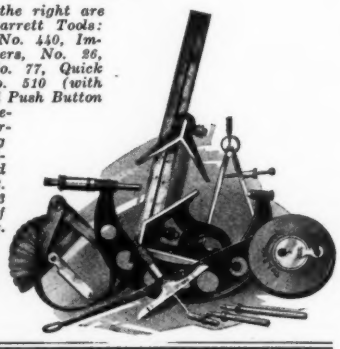
What is the cause of this world-wide preference for the Precision Tools that are made in Athol, Massachusetts? If you use Starrett Tools *you know.*

THE L. S. STARRETT CO.

World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled

ATHOL, MASS.

Shown in the group at the right are the following popular Starrett Tools: Micrometer Depth Gage No. 440, Improved Firm-Joint Calipers, No. 26, Fay Spring Dividers, No. 77, Quick Reading Steel Tape, No. 510 (with Leather case and Patented Push Button Handle Opener), Micrometer No. 224-A (with Interchangeable Anvils giving range of 2" to 6"), Combination Square No. 11, and Thickness Gage No. 73. Write for Catalog No. 23 "CE" for description of the complete Starrett Line.



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(Continued from Page 24a)

Addition to Vocational School. Plans have been completed for the addition to the vocational school at Paterson, N. J.

Humane Poster Contest. The American Humane Association of Albany, N. Y., has announced the opening of its annual humane poster contest for pupils in all grades of the public and high schools, preparatory schools, and art students and persons above school age. The society offers four prizes amounting to $50, and in addition, certificates of merit for creditable drawings. The contest closes on June first.

Steel Square Class. A class in steel square has been organized at Ottawa, Kans., for the benefit of carpenters. Mr. E. W. Vaughn is the instructor.

Electrical Workers Enrolled. Seventy-four electrical workers have been enrolled in electrical classes at Pittsburg, Kans., and in nearby villages.

Shop Work Classes. Shop work at home has gained a good start among vocational students at Winfield, Kans. Three old forges were loaned to the students who were not able to purchase their equipment at once. This is part of a plan to have each vocational student have a farm shop at home.

Agricultural Exhibit. The vocational agriculture department of the Crawford County High School, Cherokee, Kans., entered an exhibit open to high schools at the county fair held at Girard, last fall, and won first prize of $50. The judging team of the department also won $30 of the $40 offered.

Vocational Agriculture Introduced. Vocational agriculture is a new department at Jewell, Kans., but it is making good progress, with prospects of making a success the first year.

Complete Poultry House. The boys in the vocational agriculture class at the Hill City rural high school, Hill City, Kans., have completed a model poultry house of the straw-loft type.

Show Card Writing. A class in show card writing has been formed at the evening school conducted at Chanute, Kans.

Vocational Classes. In addition to vocational classes supported by the Kansas Board of Vocational Education, the following classes are being conducted in Wichita evening schools: Salesmanship; insurance salesmanship; wood cutting and pattern making; auto-mechanics, and mechanical drawing. The total enrollment in evening schools has reached 1,100.

Arithmetic Classes. A class in arithmetic for carpenters, and two classes for railway machinists have been started at Parsons, Kans. Classes in home nursing, cooking, dressmaking and millinery have been formed. A class in arithmetic for carpenters has also been formed at Arkansas City, Kans. Mr. H. E. Bowman is the instructor.

Vocational Trade Classes. The evening schools of Kansas City, Kans., have enrolled nearly 2,500 students, ranging in age from 14 to 85 years. Among the interesting classes in the school are the vocational trade classes consisting of classes in sheet metal work, boiler making, house carpentry, trade drawing, machine-shop work, electricity, automobile mechanics, shop mathematics, blue print reading, and plant development.

Shop Classes. Classes in blue print reading, plant development, and shop mathematics have been formed at the Kansas City Structural Steel Plant, Kansas City, Kans.

Electrical Instruction. Electrical workers in and around Pittsburg, Kans., have enrolled in a class which meets at the Kansas Teachers' College, and is taught by Mr. E. W. Jones. A class for men in electrical jobs in and around coal mines near Franklin has been formed at the high school and is taught by W. H. Matthews.

Excel in Bookbinding. At the convention of Employing Bookbinders of America held in Chicago the exhibits presented by the New York City schools carried off the honors. The vocational school for boys received first prize; public school No. 50, Bronx, second prize; public school No. 8, Brooklyn, honorable mention. Other schools exhibiting in the junior division, in which classification alone the New York schools were eligible, were: the Boston prevocational schools, the Empire Junior High School, Cleveland, O.; the American School for the Deaf, Hartford, Conn., and St. Hedwig's Printery, Niles, O.

Offer Variety of Shop Work. The several well-equipped shops of the South Bend, Ind., vocational department reached over 2,000 boys in the past year. The department offers courses in machine shop practice, auto-mechanics, electrical work, carpentry, cabinet-making, pattern-making, printing, architectural and machine drawing, and mill room practice. A number of well-equipped shops are found in the new vocational school, and it is hoped in the near future that additional courses in the building trades may be provided.

South Bend, Ind. The vocational guidance bureau staff has been enlarged to include a worker who will attend to placement, thus increasing the possibilities of service to junior working pupils. The department aims to give the child a basis for the intelligent and wise choice of a vocation, to prepare boys and girls for definite activities in adult life, and to confirm the statement that education pays.

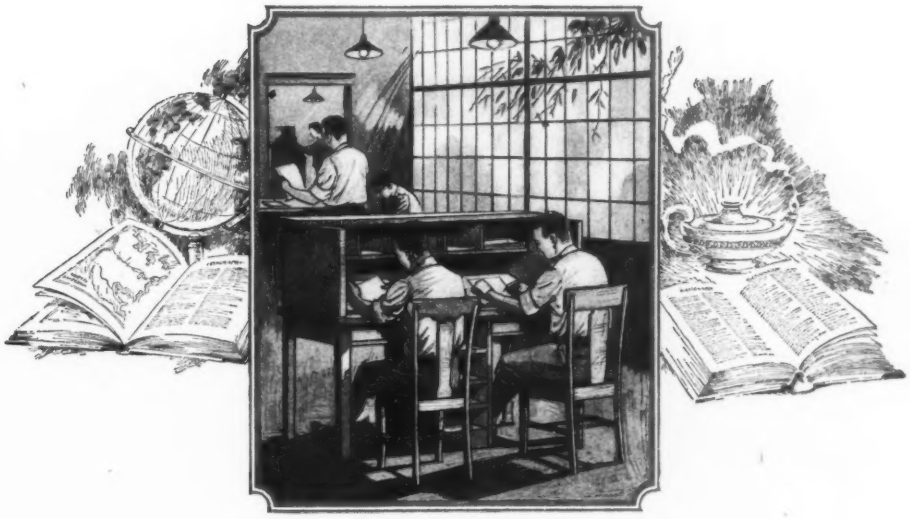
A phase of the vocational guidance work is the study of occupations. One hour a week is given to this work in the seventh grade, two and one-half hours in the eighth grade, and one hour in the ninth grade. The pupil is taught the requirements of his chosen work and is assisted in making the proper adjustments.

Evening Trade Classes. At Springfield, Mo., evening classes in shop mathematics, drafting for metal and building trades have been established for workers in these trades. Classes are held two nights each week.

Making Art Practical. An experiment in making the teaching of art practical has been made at Wilmington, Del., under the direction of Dr. A. W. Barker, in School No. 9. A chart showing 21 chairs of different styles is placed before the class, and the various types are discussed, the details of construction explained, and the appropriateness and history of the style studied. Following the study of styles by the class, the chart was made the subject of an essay in the English class.

Vocational Classes. The vocational schools at Wilmington, Del., opened with an enrollment of 892 pupils, 711 of whom are registered in the white school and 181 in the colored school. In the white school, such courses as stationary engineering, cooking, mathematics sewing, machine shop work, drawing, plumbing, electricity, sheet metal, plan reading and estimating, auto-mechanics, and millinery are offered. The colored pupils are given the benefit of courses in auto-mechanics, English and mathematics, commercial work, drawing and sewing.

(Concluded on Page 28a)



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THE-BOY-AT-THE-PROOFREADER'S-DESK is trained to detect errors in spelling, punctuation, paragraphing, capitalization, syntax, accurate statement, margining, and all other factors that go to make up the perfect printed article. Successful proofreading is quite an education in itself, yet it is only one of the four major operations in printing—composition, imposition and presswork being the other three.

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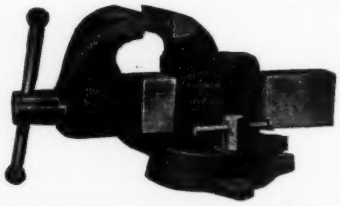
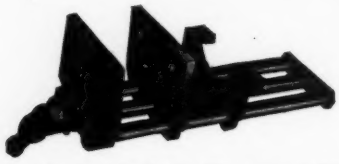
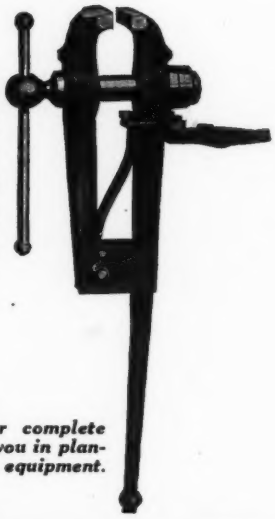


Columbian Malleable Iron Machinists' Vises will give real service. Made in all standard types and sizes.



Columbian Manual Training Vises are widely used in all wood working industries. Choose the style and size to meet your needs.



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CLEVELAND OHIO

(Continued from Page 26a)

New Shops in Use. The Cochran Junior High School, at Johnstown, Pa., dedicated on November 24th, is equipped with shops for all kinds of manual arts work, as well as domestic arts and science. The manual arts wing is one story in height and has a floor area of 13,290 square feet. It contains two drafting rooms, an electrical shop, a mill room, a joinery room, a sheet metal shop, a printing room, a blue printing room, storage room and office.

The domestic arts wing, like the manual arts wing, is one story in height and has a floor area of 11,334 square feet. In this section are located the cafeteria, cooking and sewing rooms, and a model apartment consisting of living room, dining room, kitchen, bed room, bath and laundry.

The trade school enrollment in twelve cities of New Jersey in 1924 was 833. Students graduating in full courses and placed in industry as journeymen were as follows: machinists and toolmakers, 78; carpenters, 11; patternmakers, 5; electricians, 23; plumbers, 3; painters, 8; draftsmen, 27; silversmiths, 7; textile, 7; auto mechanics, 6; dressmakers, 11.

To Appoint New Directors. The board of education of Providence, R. I., has been asked to create the position of director of manual arts, the director to have charge of all drawing, manual training, cooking, sewing and shops, at a salary not to exceed $4,000 per year. The position of supervisor of drawing is also to be created, the supervisor to be subordinate to the director of manual arts, at a salary not to exceed $2,500 a year.

Prevocational Students in Boston Schools. That courses in prevocational centers and in cooperative high schools of Boston keep in school for a year or two longer boys who would otherwise drop out, is the fact brought out by Supt. J. E. Burke of that city, in his recent annual report. The graduates of the courses have made remarkably fine records, and among its graduates are foremen, superintendents, salesmen, manufacturers, and in one case, a missionary.

The reports indicate that between 80 per cent and 90 per cent of the graduates are going on into high school. Seventy-five per cent of these have reached the legal age for leaving school, so that it is a desire for further education that is guiding a large number of the boys on into the high school. It is believed that no course holds its pupils more successfully, and the percentage going on to high school is constantly increasing.

The courses have a great advantage in that they furnish high school education and apprenticeship training together. It is the intention that the receiving of the high school diploma shall represent the close of the apprenticeship period, so that upon graduating, the boy becomes a journeyman worker.

Second Memorial Design Contest. The second annual memorial design contest, sponsored by the Pittsburgh Memorial Art Club, will be conducted during the year 1924-1925. The contest is conducted by the art departments in the high schools of western Pennsylvania and a number of special prizes will be awarded in accordance with rules laid down by the Memorial Craftsmen of America. In addition to the prizes offered by the Memorial Craftsmen, individual retailers or groups of memorial retailers, operating as district organisations, are offering cash prizes. The designs will be on exhibition at the twentieth annual convention of the Memorial Craftsmen of America, to be held August 18, 19, 20, and 21, at Cleveland.

A short course in plumbing and heating was conducted during the autumn months by the University of Illinois. The class included 45 students.

—Shelbyville, Ind. A special room has been opened in the junior high school to take care of retarded and mentally deficient pupils of junior high school age. A special course is offered, providing for work in shop subjects, sewing, cooking, craft work, fine art, music and physical training.

—The new vocational school at La Crosse, Wis., was opened with an address by William Luening, president of the board of education. George P. Hambrecht, state director of vocational schools, delivered the principal address. After the exercises a lunch was served by students of the cookery department.

PERSONAL NEWS

Mr. B. H. Van Oot, formerly at the State Agricultural and Mechanical College of Virginia, has been appointed state supervisor of trade and industrial education, to succeed Mr. Raymond V. Long. Mr. Van Oot was for five years director of teacher-training work at the college.

Mr. H. L. Klug, of Iowa, has been appointed associate professor of industrial education at the State Agricultural and Mechanical College of Virginia.

Mr. Linscott Ballentine of Norfolk, Va., has been appointed specialist in charge of foreman training for the State Education Department of Virginia. Mr. Ballentine will devote his time to conducting foreman training conferences in the several industries throughout the state.

Mr. T. A. Glover, for the past several years head of the department of vocational training at the Georgia School of Technology, Atlanta, has been appointed itinerant teacher-trainer in trade and industrial education in Virginia. Mr. Glover makes his headquarters at Richmond.

The semi-annual meeting of the North Texas Vocational Teachers' Association will meet at Denton during February. The program is now being arranged by Chairman Charles Marten of the A. and M. College.

The Board of Education, at El Paso, Texas, has recently announced the purchase of a centrally located plot on which will be built their new vocational school, bonds for which were voted some time ago. Plans for the building are under way by the architects in cooperation with State Director J. M. Hall, of the Trades and Industries Division. Mr. Hall visited El Paso for this purpose during January.

Huntsville, Texas, has recently added industrial arts and home economics to their high school curriculum.

N. S. Hunsdon is now doing teacher-training work at San Antonio, Texas. Mr. Hunsdon, the former director of trades and industries, is now connected with the Department of Extension of the University of Texas.

State Director J. M. Hall and **Prof. N. S. Hunsdon** represented Texas at the Indianapolis meeting of the State Directors' Association in December. Schools at St. Louis and elsewhere were visited. A mimeographed report of the meeting and schools visited has been made available by the State Department of Education.

F. O. Eppright has recently been added to the faculty of the College of Industrial Arts, Denton, Texas.

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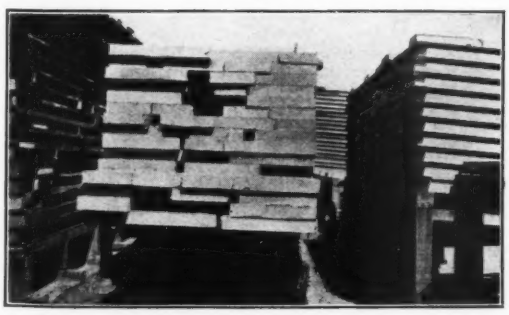
CALIFORNIA SUGAR PINES are the largest pine trees in the world. The huge logs from these pines produce long boards of exceptional widths and thicknesses. Any size pattern can be made from Sugar Pine, without having to glue up many small pieces. This fine, light pattern lumber has a soft, uniform texture which reduces the cost of working up, either by hand or machine. Sugar Pine patterns hold their shape—without warping, shrinking or checking.

Botanically, California Sugar Pine is a *white pine*—one of the five needle species. Furthermore, the cell structure of Sugar Pine is so like that of eastern white pine that the microscope can scarcely detect a difference. Tests made at the U.S. Government Forest Products Laboratory at Madison, Wisconsin, reveal that California Sugar Pine is a western counterpart of eastern white pine. In specific gravity it comes within .003 of eastern white pine; in volumetric shrinkage from green to oven-dry, it comes within ½ of 1% of eastern white; in softness within 7%, and in strength (as beam or post) within 2% of eastern white. This is a smaller variation than might be expected between different pieces of Pinus Strobus.

The demand for Sugar Pine is increasing throughout the United States, while it has been used for a half century in the foundries of the Pacific Coast. It is available in the same grades as the old "cork"—with the added economy of wider widths and greater thicknesses.

Use Sugar Pine for *your* pattern work. Write this association, and we will see that a nearby dealer makes a quotation and supplies you with sufficient stock for a real test.



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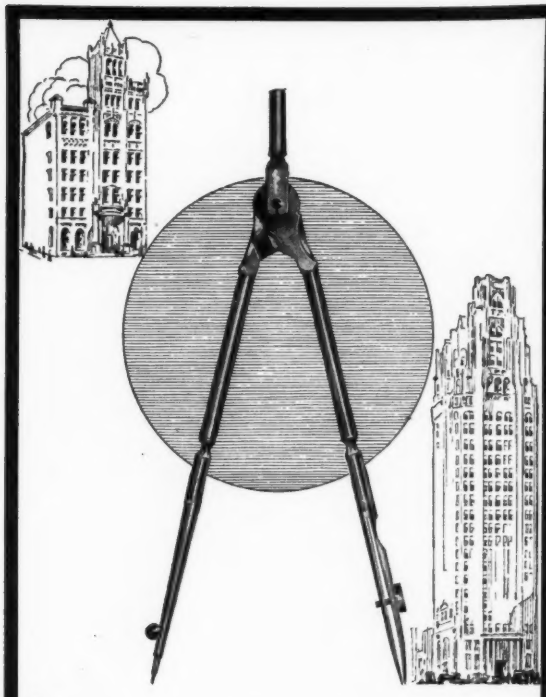

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NEW BOOKS

Essentials of Sewing

By Rosamond C. Cook. Cloth, 238 pages. Price, $1.40. Manual Arts Press, Peoria, Ill.

A carefully arranged text, in which the essential processes of sewing as applied to home garment-making are explained for beginners. The book will serve splendidly for study and reference in connection with any well-organized course based on the project method.

Practical Brick-Laying

By Howard L. Briggs and William Carver; 223 pages. Price, $1.75. McGraw-Hill Book Co., New York, N. Y.

The sub-title of this book is a "handbook of instruction and a manual for the journeyman." The work is a fairly complete description of the materials and processes of the brick-laying trade, and a discussion of the problems of establishing and conducting schools and classes for apprentice brick-layers. Teachers of brick-laying will find the outline of trade problems and trade tests especially useful.

Electric Wiring

By Albert A. Schuhler. Cloth, 361 pages. Price, $2.50. McGraw-Hill Book Co., New York.

The book has been "designed to be a systematic course for the use in evening trade or vocational schools." The essential features of electric wiring, namely: knob and tube, B. X., wood molding, metal molding, flexible and rigid conduit or fixture wiring are, however, not included.

In some departments, notably splicing, bell work and connecting of switches for lighting circuits, the chapters or "units" cover almost every conceivable method of wiring. In fact, the text (contrary to our latest methods of teaching) leaves little opportunity to develop any originality or power of problem solution on the part of the instructor or the pupil. The work in these departments is so complete as to include many jobs which have no practical value and others which would never be used by a practical electrician because of being contrary to the spirit or letter of the national electric code.

The book is composed of nine "units" under the following captions: Wire splicing, bell wiring, annunciator wiring, burglar alarm wiring, electric light wiring, house wiring plans, telegraph wiring, telephone wiring, and testing.

Industrial Education in the Public Schools of Minnesota

By Homer J. Smith. Educational Monograph No. 6. Paper, 154 pages. Price, $1. Published by The University of Minnesota, St. Paul.

This study appeals to us as one of the most useful analyses of a state system of vocational education which has appeared up to the present time. While it was made for the purpose of determining the responsibility of the university in teacher training for industrial and vocational positions, the writer has gone boldly forward and made an analytical and historic study of the entire system of manual training, industrial arts, and vocational training in the elementary and high schools of the entire state.

The introductory chapter indicates the growth of industrial work during the past 30 years, and the second chapter surveys the actual work done during 1922-23 in 65 representative systems. It makes clear what subjects are offered, how much time allowed for shop work, what credits are given, what courses are involved, and what educational results have been achieved. The last mentioned study takes in the occupations now pursued by 861 boy graduates of 1922 and 465 of 1917.

The third chapter takes up the equipment and products of the school shops. This is followed by an analysis of methods and class management of shop classes. The final chapters take up objectives of industrial courses and the type of training needed by shop teachers.

The book deserves wide study because it is an unadorned statement of facts and a worth-while departure from the customary theoretic discussions of proposed methods.

Electrical Drafting and Design

By Calvin C. Bishop. Cloth, 165 pages. Price, $2. McGraw-Hill Book Co., New York, N. Y.

This book is intended to provide a course in drafting as applied to electric light wiring for illumination and power purposes. It has been particularly written for advanced high school students who have had a two-year course in mechanical drawing, and who desire to specialize preparatory to entering the electrical trades or electrical drafting.

The book is provided with complete tables and charts

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Standard alligator jaws for ordinary taper shank bits. Ball bearings in head. Ratchet, pawl and jaws of hardened forged steel. Heavily nickel plated. Cocobolo wood head and handle. A thoroughly dependable Bit Brace for manual training use.

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(Concluded from Page 30a)

for reference use on the drafting table of the electrical wiring draftsman.

Blue Print Reading and Shop Sketching

By H. C. Givens. Cloth, 120 pages. Price, $1.75. John Wiley & Sons, New York, N. Y.

This book is the result of several years of teaching the elements of blue print reading to men engaged in the metal trades. Of the numerous works on this subject which have come to our attention, the present book appeals to us as the most logical and teachable.

Part I presents a series of exercises in reading typical drawings, from the simplest one-view drawing to a rather complicated three-view drawing, with notes and instructions. Part II suggests a carefully arranged course in shop sketching, and Part III contains the elements of instrumental drawing, beginning with projection, and continuing with a few fundamental principles and essential standards and conventions.

The book is well illustrated with facsimile blue prints and will serve excellently for unit evening courses.

Automotive Construction and Operation

J. C. Wright and Fred C. Smith. Cloth, octavo; 462 pages. Price, $3, net. John Wiley & Sons, New York.

This book is an untechnical account of the construction, functions, and operation of the several units of the gasoline automobile. It is addressed to beginners in trade classes, owners who desire to know how the parts of the machine "operate," and mechanics and salesmen. The problems of care, maintenance, and repair are not taken up. Illustrations are complete and clear. A modest amount of instructional aids in the shape of questions are appended to each chapter.

A Laboratory Manual of Machine Shop Practice

By Jerry H. Service and George E. Frease. Cloth, 106 pages. Illustrated. Price, $1.25. D. Van Nostrand Co., New York City.

Pamphlet Binding

A group of standard apprenticeship lessons issued by the Department of Education, United Typothetae of Chicago.

This standard series of lessons follows the form and method of the previous splendid series of trade instruction for apprentice printers. It includes lessons in hand folding, machine folding, gathering, wire stitching, sewing, attaching covers, trimming, stitcher mechanism, operation of hand and power punches, perforating, crimping and round cornering and paging, machine gluing, padding, wrapping, machine cutting, and care of cutters and cutter knives. As in the case of previous groups the material is extremely practical, simple, and well illustrated. It has been tested out under various school shop conditions.

Publications Received

Brick-laying. By G. A. McGarvey, regional agent for trade and industrial education for the Federal Board of Vocational Education. Bulletin No. 95, of the Trade and Industrial Series No. 27, June, 1924, issued by the Federal Board of Vocational Education, Washington, D. C. An analysis of the trade of bricklaying, together with suggestive courses of training for apprentices and journeymen workers. The pamphlet discusses the organization and plans for apprentice training, the analysis of the trade, courses of instruction and training, and the preparation of job sheets.

The Printing Trades. Bulletin No. VI, of the Indianapolis Vocational Information Series. Prepared by H. D. Kitson and E. L. Yeager, and issued by the Indianapolis Chamber of Commerce and Indiana University. The pamphlet discusses the duties and wages of the worker in each department of the trade and indicates the opportunities to be found in this occupation.

The Work of the Journalist. Bulletin No. VII, of the Indianapolis Vocational Information Series. Prepared by E. L. Yeager and Harold Strow, and issued by the Indianapolis Chamber of Commerce and Indiana University. The pamphlet gives an outline picture of journalism, offers literature bearing on the subject, and gives a scientific survey of the personnel in the publishing establishments of Indianapolis.

The Permanence of the Vocational Interests of Junior High School Pupils. By Edward E. Franklin. Bulletin No. 8, of the Johns Hopkins University, Baltimore, Md. The pamphlet discusses distribution of vocational choices, justification of vocational guidance in the junior high school, interests and intelligence of eliminated pupils, the relation of interest to ability, in an intensive study of pupils, and variations among the vocational groups in the permanency percentages and intelligence levels.

English for Printers

Bound octavo, 116 pages. United Typothetae of America, Department of Education, Chicago.

This latest addition to the standard apprenticeship lessons for printers limits itself to word study and is intended to fit the young printer to understand the materials—words—which make up the English language. The book is arranged in the form of ten unit lessons outlining the value of English, the history of the language, the use of the dictionary, pronunciation, prefixes and suffixes, division of words, compounding of words, derivations and spelling. Each lesson includes a carefully graded series of exercises and group of questions. The book is of the same high standard and practical completeness which is characterized in the earlier volumes of the series.

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Classes in Plumbing

The Fox River Valley Master Plumbers' Association has introduced classes in plumbing in five Wisconsin cities, namely: Fond du Lac, Oshkosh, Appleton, Green Bay and Sheboygan. An itinerant instructor is employed. George F. Reeke of Green Bay, who is promoting the project, says:

"The itinerant instructor will have afternoon and evening classes. Master plumbers are expected to take this compulsory education. Apprentices objecting to this requirement are not desired in the trade, and are given to understand that this is an opportunity it is to their interest to take advantage of.

"The evening classes will be attended by apprentices, journeyman plumbers, and master plumbers who desire to brush up on plumbing problems. We also expect to conduct a class of steamfitters' apprentices, as it is contended that many of the problems, such as areas, capacities, reading plans, etc., interest both trades.

"Men capable of lecturing on such subjects as salesmanship, service to customer and employer, and any other subject which will have a broadening influence on the scholars, will be called in periodically, so that it is safe to predict that the mechanic who has had the benefit of this training will have a broader conception of the value his calling is to himself and the community he serves."

Vocational Courses

At Gary, Indiana, the various shops of the schools are open in the evening for industrial workers who are ambitious to advance in their work. The shops having a good enrollment are the machine shops and foundries, auto-mechanics, cabinet-making and drafting rooms.

There are also courses in telegraphy, furniture repair, and radio for groups of men interested in these lines of work. While courses are offered to men in whatever special work there is a demand, courses are also offered to women. Among these are millinery, sewing, cooking, home decoration, china painting, basketry and knitting. In addition to these, regular commercial courses are offered for those desiring to extend their knowledge in the commercial field. The main courses offered are commercial English, arithmetic, bookkeeping, shorthand and typewriting, special machine operation, filing and accounting.

PERSONAL NEWS

Mr. O. K. Snyder, of Jeanette, Pa., has resigned from his position as head of the industrial and part-time vocational training department of the public schools.

Miss Pearl Bonner has resigned her position as domestic science teacher at Nooksack, Wash., to accept a position at Walla Walla.

Miss Margaret Wilder, of Gardner, Mass., has been appointed assistant supervisor of drawing in the schools of Framingham, Mass.

J. W. Curtis of Spangle was elected president of the Spokane branch of the Washington Education Association. M. E. Brown, assistant county superintendent of schools, was elected secretary, and Miss Georgene Scott of Vera, treasurer.

Mr. Joseph F. Gould has been appointed as director of the evening schools of Boston, Mass., to succeed M. J. Downey. Mr. Gould has been connected with Boston school activities for the past sixteen years and is an expert in the organization and administration of schools.

Mr. Ralph L. Jacobs of Wilmington, Del., has been elected director of vocational education at Lewiston, Pa. Mr. Jacobs has had extended training and experience in the field of vocational education, and supervision and administration. He was at one time acting state supervisor of trade and industrial education in Delaware.

Mr. W. J. Groschke, formerly in charge of trade cabinet making at the Academy high school, Erie, Pa., has succeeded Mr. Cressman as director of vocational education.

Mr. Willis R. Skillman, county supervisor of agricultural education for Cumberland County, Pa., has become State Supervisor of Agricultural Education for the State Education Department. Mr. Skillman is a graduate of Pennsylvania State College and has completed graduate work at Cornell University. He has been unusually successful as a teacher and as a director of vocational agriculture, and has shown considerable initiative and energy. He recently completed a first-hand study of agricultural practices in England and on the Continent.

Mr. Harold Parks, of the South Middleton Township Vocational High School of Cumberland County, Pa., has been appointed to succeed Mr. Willis Skillman as director of vocational education in the county schools.

PUBLICATIONS RECEIVED

Varnish Studies. By W. T. Pearce. Special circular issued by the educational bureau of the Paint Manufacturers' Association of the U. S. National Varnish Manufacturers' Association. It represents a study of relationships of physical tests and chemical composition to durability.

Motion Picture Films. The General Electric Co., of Schenectady, N. Y., has issued a 47-page booklet describing the 22 advertising films made and distributed by that firm. The films tell the story of the construction of the Panama Canal, the growth and development of the first railroad, electricity, porcelain making, cane sugar industry, cotton industry, x-ray, foundry work, and forestry activities in the northwest.

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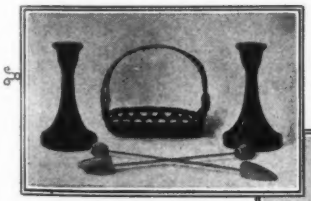

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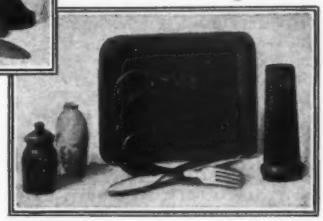

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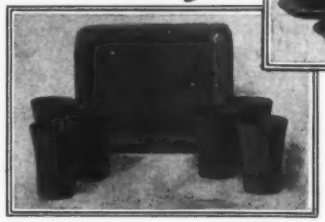

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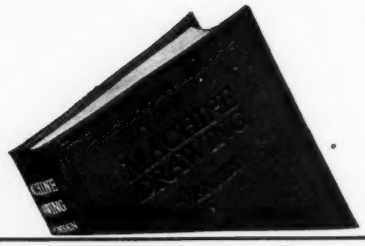

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New Portable Combination Wood Worker. The Tannewitz Works at Grand Rapids, Mich., has announced the marketing of a new portable wood worker, which saves the cost of several individual machines by doing every kind of sawing and planing desired right at the point of construction. The machine consists of a full-size saw bench, with swinging saws fifteen inches in diameter, a six-inch hand jointer with extra long tables, a two-horsepower motor, a pair of twelve-inch saw blades, and a threaded sleeve permitting dado heads as wide as three inches.

The equipment consists of two graduated miter gauges, with stop rods, steel splitter and overhanging cage guard, graduated segment for indicating the tilt of the table, plain rip fence, tilting jointer fence, hand or foot-operated fused switch, and a three-wheel, ball-bearing, lift truck, permitting the machine to be moved about at will

NEW PORTABLE COMBINATION WOODWORKER.

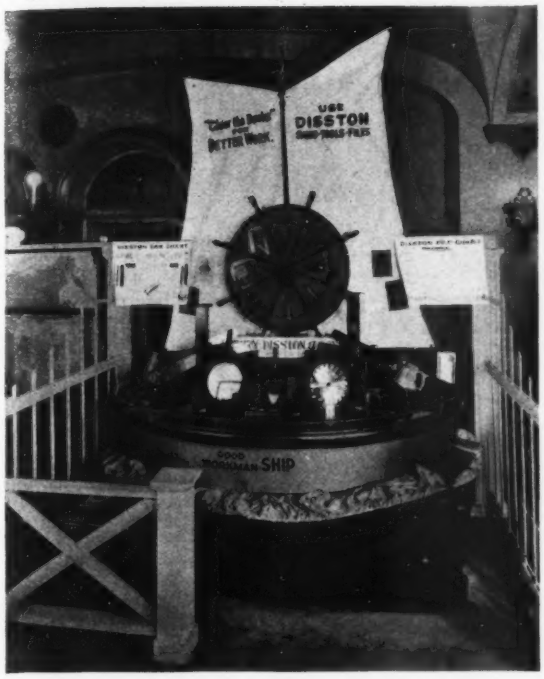
and to be set on the floor in any desired position.

The jointer uses high-speed, steel knives six inches long, and is mounted on a circular cylinder. The length of the jointer table over all is 33 inches. The jointer is readily stopped and started by turning a hand wheel at one end. A spring aluminum guard is supplied on all jointers.

Composed practically of full-size machines, the wood worker is able to do accurate work at production speed, which is not possible with the small, bench type of portable machine now frequently used. The portability increases the usefulness of the machine immensely. Its convenience cannot be over-estimated, as the student may place it in the most advantageous position in connection with his work, so that he has the fewest possible number of steps to take. The full size feature of the machine, together with plenty of power, plus its portability, make it a very convenient and usable piece of equipment for the school shop.

Disston's Have Unusual Exhibit at Indianapolis. At the December Convention of the National Society for Vocational Education, the craft "Good Workmanship" was steered into port in the Palm Room of the Claypool Hotel. It was chartered by Disston's Educational Department and the log showed W. C. Wright as skipper. Instead of spices from the South Seas or ivory from the Sudan, the deck was laden with manual training tools whose attractiveness drew a continuous stream of vocational directors to her side. As a part of the general contest a sign was draped over the starboard side asking: "Of 3,600 Disston employees, how many have served with Disston twenty years or longer?" The correct number, 502, was very

(Concluded on Page 39a)



HENRY DISSTON & SONS EXHIBIT AT INDIANAPOLIS, DECEMBER, 1924.

(Concluded from Page 36a)

closely estimated by three members at 500. The three-year-old daughter of Mr. Harry E. Wood, Indianapolis, drew the winners so that the prizes were presented as follows:

Mr. A. B. Anderson, Edgemoor, Delaware, a D-115 Victory Hand Saw.

Professor F. C. Whitcomb, Oxford, Ohio, a 24" Disston Adjustable Plumb and Level.

Miss Margaret Schliecher, Indianapolis, a No. 150 latest model Disston Pruning Shear.

In spite of the Indianapolis drouth, Skipper Wright drew anchor Saturday and sailed for Chicago, where the ship will display its wares at the Vocational Education Association of the Mid West, February 12th to 14th.

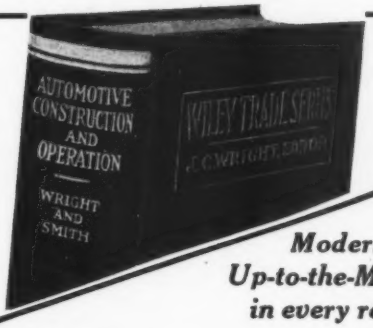
New Melting Furnace. The Johnson Gas Appliance Company of Cedar Rapids, Iowa, has just announced the addition to the Johnson line of gas furnaces and appliances the new Johnson No. 305 Soft Metal Melting Furnace. This furnace is fitted with a removable 300 lb. capacity cast iron melting pot, with a removable lid and outlet valve for drawing off the molten metal. It is very simple in construction, economical in gas consumption and easy to operate. The furnace is especially adapted to school use for melting soft metals used in the foundry, for recasting linotype and monotype metal, etc.

JOHNSON No. 305 SOFT METAL MELTING FURNACE.

Mr. E. A. Hutchinson has been appointed as part-time instructor in agriculture at Clintonville, Wis. Mr. Hutchinson conducts classes in the high school two days each week, and gives the remainder of the week to agricultural work in the towns.

Mr. J. B. Hobdy, of Alabama, has been elected president of the National Association of State Directors of Vocational Education. Other officers elected were: Z. M. Smith, Indiana, secretary-treasurer, and T. J. Trinder, Connecticut, vice-president.

Some New Wiley Books In The Vocational Education Field



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